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TRANSACTIONS

OF THE

AMERICAN ORTHOPEDIC ASSOCIATION.

TENTH SESSION,

HELD AT BUFFALO, N. Y.,

MAY 19, 20, AND 21, 1896.

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LIST OF OFFICERS.

[Elected May 21, 1896.]

PRESIDENT.

SAMUEL KETCH, M.D.

VICE-PRESIDENTS.

H. M. SHERMAN, M.D.
W. R. TOWNSEND, M.D.

TREASURER.

E. G. BRACKETT, M.D.

SECRETARY.

JOHN RIDLON, M.D.,
103 State Street, Chicago.

COMMITTEE ON MEMBERSHIP.

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A. J. GILLETTE, M.D. W. R. TOWNSEND, M.D.
W. J. TAYLOR, M.D.

EXECUTIVE COMMITTEE.

The President, the Treasurer, and the Secretary.

PUBLICATION COMMITTEE.

J. E. GOLDTHWAIT, M.D. (*Ch'n*), E. H. BRADFORD, M.D.
H. L. TAYLOR, M.D.

MEMBER OF EXECUTIVE COMMITTEE, CONGRESS OF AMERICAN PHYSICIANS AND SURGEONS.

A. M. PHELPS, M.D.
Alternate: E. H. BRADFORD, M.D.

LIST OF PRESIDENTS.

1887. V. P. GIBNEY, M.D.
1888. NEWTON M. SHAFFER, M.D.
1889. E. H. BRADFORD, M.D.
1890. DE FOREST WILLARD, M.D.
1891. A. B. JUDSON, M.D.
1892. BENJAMIN LEE, M.D.
1893. A. J. STEELE, M.D.
1894. A. M. PHELPS, M.D.
1895. JOHN RIDLON, M.D.
1896. ROYAL WHITMAN, M.D.
1897. SAMUEL KETCH, M.D.

MEMBERS.

* Original Members.
† Deceased.

1889. Bartow, Bernard, M.D. Clinical Professor of Orthopedic Surgery in the Medical Department of the University of Buffalo; Orthopedic Surgeon to Children's Hospital of Buffalo. 481 Delaware Avenue, Buffalo, N. Y.

1892. Blanchard, Wallace, M.D. Attending Orthopedic Surgeon to the Home for Destitute Crippled Children. 34 E. Monroe Street, Chicago.

1889. Brackett, E. G., M.D. Assistant Surgeon to the Children's Hospital. 133 Newbury Street, Boston.

*1887. Bradford, E. H., M.D. Visiting Surgeon to the Children's and the Good Samaritan Hospitals; Assistant Professor of Orthopedic Surgery in Harvard Medical School. 133 Newbury Street, Boston.

*†1887. Brown, Buckminster, M.D.

*1887. Brown, Dillon, M.D. Adjunct Professor of Diseases of Children in the New York Polyclinic; Consulting Physician (in Pediatrics) to the Astoria Hospital; Visiting Physician to the Episcopal Orphans' Asylum and the St. John's Guild Hospital for Children. 40 East Fifty-seventh Street, New York.

*1887. Bryant, Joseph D., M.D. Professor of Anatomy and of Clinical Surgery, and Associate Professor of Orthopedic Surgery in Bellevue Hospital Medical College; Visiting Surgeon to Bellevue and St. Vincent Hospitals; Surgeon-General National Guard, S. N. Y. 54 West Thirty-sixth Street, New York.

1889. Burrell, Herbert L., M.D. Surgeon to the Boston City and Children's Hospitals; Assistant Professor of Clinical Surgery, Harvard University. 22 Newbury Street, Boston.

1891. Cook, Ansel G., M.D. Orthopedic Surgeon to the Hartford Hospital. 164 High Street, Hartford, Conn.

1893. Coolidge, Frederic S., M.D. Demonstrator of Orthopedic Appliances in Rush Medical College; Professor of Orthopedic

Surgery, Chicago Post-Graduate Medical College; Attending Orthopedic Surgeon to the Home for Destitute Crippled Children. 103 State Street, Chicago.

1895. Dane, John, M.D. Surgeon to Marcella Street Orphan Home. 11 Arlington Street, Boston, Mass.

*†1887. Develin, Edward, M.D.

*1887. Foster, Charles C., M.D. Orthopedic Surgeon to the Cambridge Hospital; Visiting Physician to the Avon Home for Children; Visiting Physician to St. Luke's Home for Children. 5 Riedesel Avenue, Cambridge, Mass.

*1887. Gibney, V. P., M.D. Clinical Professor of Surgery in the College of Physicians and Surgeons; Surgeon-in-chief to the New York Hospital for Ruptured and Crippled; Orthopedic Surgeon to the Nursery and Children's Hospital, and to the Montefiore Home and Hospital, New York. 16 Park Avenue, New York.

1889. Gillette, Arthur J., M.D. Visiting Orthopedic Surgeon to University Dispensary; and Orthopedic Surgeon to St. Luke's Hospital, St. Paul. 301 Pleasant Avenue, St. Paul, Minnesota.

1892. Goldthwait, Joel E., M.D. Surgeon to the Good Samaritan Hospital; Assistant Surgeon to the Children's Hospital; Orthopedic Surgeon to Carney Hospital; Surgeon to Marcella Street Orphans' Home. 398 Marlborough Street, Boston.

1892. Griffith, J. D., M.D. Professor of Surgery, Kansas City Medical College; Surgeon to All Saints, St. Joseph's, Children's, and German Hospitals; President of the State Board of Health; Surgeon-General National Guard, S. Mo. S. W. corner Ninth and Grand Avenue, Kansas City, Missouri.

1892. Hoadley, A. E., M.D. Professor of Orthopedic Surgery and Surgical Diseases of Joints, Chicago Polyclinic; Professor of Orthopedic Surgery and Surgical Diseases of Joints and Clinical Surgery, College of Physicians and Surgeons; Attending Orthopedic Surgeon to the Home for Destitute Crippled Children, Chicago. 683 Washington Boulevard, Chicago.

*1887. Hogden, Harry, M.D. Professor of Orthopedic Surgery, St. Louis Medical College (Medical Department of Washington University). 2604 Locust Street, St. Louis.

1893. Hosmer, A. B., M.D. Orthopedic Surgeon to St. Luke's Hospital; Attending Orthopedic Surgeon to the Home for Destitute Crippled Children. 103 State Street, Chicago.

1893. Hubbard, LeRoy W., M.D. Senior Assistant Surgeon to New York Orthopedic Hospital and Dispensary. 161 West Twenty-third Street, New York.

*1887. Judson, A. B., M.D. Orthopedic Surgeon to Out-patient Department of the New York Hospital. 1 Madison Avenue, New York.

1894. Kerr, James, M.D., M.Ch. Surgeon to the Emergency Hospital; Surgeon to the Providence Hospital; Surgeon to the Woman's Hospital; Professor of Surgery in the Georgetown University. 1711 H Street, N. W., Washington, D. C.

*1887. Ketch. Samuel, M.D. Senior Assistant Surgeon to the New York Orthopedic Hospital; Surgeon to the Randall's Island Hospital; Clinical Professor of Orthopedic Surgery in the New York Woman's Medical College. 72 West Fifty-fifth Street, New York.

*1887. Lee, Benjamin, M.D. Secretary of the State Board of Health of Pennsylvania; Professor of Orthopedics in the Philadelphia Polyclinic and College for Graduates in Medicine. 1532 Pine Street, Philadelphia.

*1887. Lovett, Robert W., M.D. Surgeon to the West End Nursery; Assistant Surgeon to the Children's Hospital; Out-patient Surgeon to the Boston City Hospital. 234 Marlborough Street, Boston.

1893. McCurdy, Stewart Le Roy, M.D. Professor of Orthopedic and Clinical Surgery, Ohio Medical University, Columbus, Ohio; Lecturer on Topographical Anatomy and Landmarks, Western Pennsylvania Medical College, Pittsburg, Pa.; Surgeon to the Protestant Hospital, Columbus, Ohio. 912 Penn Avenue, Pittsburg, Pa.

1889. McKenzie, D. E., M.D. Lecturer on Orthopedic Surgery in the Woman's Medical College; Consulting Orthopedic Surgeon to the Hospital for Sick Children, Toronto. 14 Bloor Street, West, Toronto, Canada.

*1887. Moore, James E., M.D. Professor of Orthopedic Surgery in the University of Minnesota; Orthopedic Surgeon to St. Mary's Hospital; Consulting Surgeon to the Northwestern Hospital for Women and Children. 125 Fourth Street, South, Minneapolis, Minn.

1889. Myers, T. Halsted, M.D. Orthopedic Surgeon to St. Luke's Hospital; Assistant Surgeon to the New York Orthopedic Dispensary; Surgeon to the Presbyterian Hospital Dispensary. 24 West Fiftieth Street, New York.

*1887. Packard, George B., M.D. Professor of Orthopedic Surgery in the University of Colorado. 1405 Stout Street, Denver.

*1887. Park, Roswell, M.D. Professor of Surgery in the Medical Department of the University of Buffalo; Surgeon to the Buffalo General Hospital; Consulting Surgeon to the Fitch Accident Hospital and the Buffalo Eye and Ear Infirmary. 510 Delaware Avenue, Buffalo, N. Y.

1890. Phelps, A. M., M.D. Professor of Surgery in the University of Vermont; Professor of Orthopedic Surgery in the University of the City of New York, Medical Department; Professor of Orthopedic Surgery in the Post-Graduate Medical School and Hospital; Visiting Surgeon to the City Hospital, New York; Consulting Surgeon to the Mary Fletcher Hospital, Burlington, Vt.; Surgeon-in-chief to the Orthopedic Department of the Post-Graduate Hospital, New York. 40 West Thirty-fourth Street, New York.

1893. Plimpton, W. O., M.D. Instructor in Orthopedic Surgery, Post-Graduate Medical School and Hospital; Assistant to the Chair of Orthopedic Surgery, University Medical School; Visiting Surgeon to the Post-Graduate Hospital New York. 40 West Thirty-fourth Street, New York.

*1887. Ridlon, John, M.D. Professor of Orthopedic Surgery in the Northwestern University Medical School; Senior Attending Orthopedic Surgeon to St. Luke's Hospital and Michael Reese Hospital; Medical Director of the Home for Destitute Crippled Children. 103 State Street, Chicago.

*1887. Ryan, George W., M.D. Clinical Lecturer on Orthopedic Surgery in the Medical College of Ohio. 114 West Ninth Street, Cincinnati.

*†1887. Sayre, Lewis Hall, M.D.

*1887. Sayre, Reginald H., M.D. Lecturer Adjunct on Orthopedic Surgery in the Bellevue Hospital Medical College; Orthopedic Surgeon to the Out-door Department of Bellevue Hospital; Consulting Surgeon to the Hackensack (N. J.) Hospital. 285 Fifth Avenue, New York.

*1887. Schapps, John C., M.D. Orthopedic Surgeon to St. Mary's Hospital Dispensary, Brooklyn. 498 Bedford Avenue, Brooklyn.

1889. Scudder, Charles Locke, M.D. Assistant in Surgery in Harvard University; Surgeon to the Out-patient Department of Massachusetts General Hospital. 189 Beacon Street, Boston.

*1887. Schaffer, Newton M., M.D. Attending Surgeon-in-

charge of the New York Orthopedic Hospital and Dispensary; Consulting Orthopedic Surgeon to St. Luke's Hospital; Consulting Surgeon to the New York Infirmary for Women and Children. 28 East Thirty-eighth Street, New York.

1889. Sherman, Harry M., M.D. Orthopedic Surgeon to the Children's Hospital and to the Polyclinic, San Francisco. 1303 Van Ness Avenue, San Francisco.

*1887. Steele, A. J., M.D. Professor of Orthopedic Surgery and Diseases of the Joints in the St. Louis Post-Graduate School of Medicine; Surgeon to the Augusta Children's Hospital, St. Louis. 2825 Washington Avenue, St. Louis.

*1887. Taylor, Henry Ling, M.D. 117 West Fifty-fifth Street, New York.

1892. Taylor, William J., M.D. Surgeon to St. Agnes's Hospital; Assistant Surgeon to the Orthopedic Hospital and Infirmary for Nervous Diseases. 116 South Eighteenth Street, Philadelphia.

1892. Thorndike, Augustus, M.D. Surgeon to the Good Samaritan Hospital and to the Boston Dispensary. 101 Beacon Street, Boston.

1889. Townsend, W. R., M.D. Professor of Orthopedic Surgery in the New York Polyclinic; Assistant Surgeon to the Hospital for Ruptured and Crippled, New York; Visiting Surgeon to Randall's Island and Bayonne Hospital; Consulting Orthopedic Surgeon to the French Hospital. 28 West Fifty-ninth Street, New York.

1889. Weigel, Louis A., M.D. Orthopedic Surgeon to the Outpatient Department of Rochester City Hospital. 43 Mortimer Street, Rochester, N. Y.

1890. Whitman, Royal, M.D. Instructor in Orthopedic Surgery and Chief of the Orthopedic Division of the Vanderbilt Clinic in the College of Physicians and Surgeons; Adjunct Professor of Orthopedic Surgery in the New York Polyclinic; Assistant Surgeon to the Hospital for Ruptured and Crippled, New York. 126 West Fifty-ninth Street, New York.

*1887. Willard, De Forest, M.D. Clinical Professor of Orthopedic Surgery in the University of Pennsylvania; Surgeon to the Presbyterian Hospital; Consulting Surgeon to the White Cripples' Home, the Colored Cripples' Home, and the Home for Incurables, Philadelphia; Consulting Surgeon to the New Jersey State School for Feeble-minded Children. 1601 Walnut Street, Philadelphia.

1891. Wilson, H. Augustus, M.D. Clinical Professor of Ortho-

pedic Surgery in the Jefferson Medical College; Professor of General and Orthopedic Surgery in the Philadelphia Polyclinic and College for Graduates in Medicine; Orthopedic Surgeon in the Polyclinic Hospital; Clinical Professor of Orthopedic Surgery in the Woman's Medical College of Pennsylvania; Surgeon to St. Mark's Home for Aged and Infirm Women, Philadelphia; Consulting Orthopedic Surgeon to the Kensington Hospital for Women, and to the Philadelphia Lying-in-Charity. 1611 Spruce Street, Philadelphia.

1893. Wirt, William E., M.D. Professor of Orthopedic Surgery in the Medical Department, University of Wooster, Cleveland, Ohio; Visiting Surgeon to University Hospital; Orthopedic Surgeon to Cleveland Hospital for Women and Children. 122 Euclid Avenue, Cleveland, Ohio.

1890. Young, James K., M.D. Instructor in Orthopedic Surgery in the University of Pennsylvania; Attending Surgeon to the Orthopedic Department of the University Hospital. 222 South Sixteenth Street, Philadelphia.

HONORARY MEMBERS.

ELECTED

1895. WILLIAM ADAMS, F.R.C.S., Senior Surgeon to the Great Northern Central Hospital and to the National Hospital for the Paralytic and Epileptic; Consulting Surgeon to the National Orthopedic Hospital. 7 London Road, St. John's Wood (N. W.), London, England.

1891. EDMUND ANDREWS, M.D., 65 Randolph Street, Chicago, Illinois.

1889. HENRY G. DAVIS, M.D., 8 Parlin Street, Everett, Mass.

*1892. WILLIAM DETMOLD, M.D., New York.

1893. O. LANNELONGUE. Professeur à la Faculté de Médecine de Paris (Chaire de Chirurgie); Membre de l'Académie de Médecine; Chirurgien de l'Hôpital Trousseau â Paris, et Député au Parlement Français, et Président de l'Association Générale de Médecine de France. 3 Rue François I., Paris.

*1889. W. J. LITTLE, M.D., F.R.C.P. Lond., M.R.C.S. Eng.

1890. WILLIAM MACEWEN, M.D., LL.D., Professor of Clinical Surgery and Surgeon to the Glasgow Royal Infirmary; Surgeon to the Royal Hospital for Sick Children. 3 Woodside Crescent, Glasgow, Scotland.

1893. LEOPOLD OLLIER, M.D., Professeur du Clinique Chirurgicale à la Faculté de Médecine de Lyon; Correspondant de l'Institut de France. 3 Quai de la Charité, Lyons.

*1889. DAVID PRINCE, M.D.

1889. LEWIS A. SAYRE, M.D. Professor of Orthopedic Surgery in the Bellevue Hospital Medical College; Consulting Surgeon to the Bellevue Hospital, the Charity Hospital, and the Home for Incurables. 285 Fifth Avenue, New York.

1891. C. FAYETTE TAYLOR, M.D. 117 West Fifty-fifth Street, New York.

* Deceased.

CORRESPONDING MEMBERS.

ELECTED

1889. Dr. F. BEELY. Steglitzer Strasse 10, Berlin, Germany.

1892. Dr. M. BILHAUT, Rédacteur en Chef des Annales d'Orthopédie et de Chirurgie pratiques; Chirurgien des enfants de l'Hôpital International. 5 Avenue de l'Opera, Paris, France.

1894. BERNARD E. BRODHURST, F.R.C.S. Eng., Senior Surgeon to the Royal Orthopedic Hospital; Surgeon to the Royal Hospital for Incurables; Consulting Surgeon to the Belgrave Children's Hospital. 20 Grosvenor Street, Grosvenor Square, London, W.

1894. Dr. JULIUS DOLLINGER, ausserordentlich-öffentlicher Professor für Orthopädie an den königl. ungarischen Universität in Buda-Pest, Operateur und dirigirenden Oberarzt der chir. Abtheilung im Spitalls der Barmherzigen Brüder in Buda-Pest; Mitglied des Landessanitätsrathes; Mitglied des Landesunterrichtsrathes; Mitglied mehrer wissenschaftlichen Gesellschaften und Vereine. Buda-Pest (Ungarn), Rerepescher Str. 52.

1892. NICHOLAS GRATTAN, F.R.C.S. Edin., Senior Surgeon, County and City of Cork Hospital for Women and Children. 24 South Mall, Cork, Ireland.

1890. Dr. A. HOFFA, Privatdocent der Chirurgie an der Universität Würzburg. Sieboldstrasse 10, Würzburg.

1890. ROBERT JONES, F.R.C.S. Edin., Honorary Surgeon, Royal Southern Hospital. 11 Nelson Street, Great George Square, Liverpool, England.

1890. Dr. E. KIRMISSON, Professeur agrégé de la Faculté de Médecine; Chirurgien de l'Hôpital des Enfants Assisté. 27 Quai d'Orsay, Paris, France.

1890. Dr. SIGFRIED LEVY, Superintending Surgeon of the Society for the Relief of Crippled and Mutilated Children, Copenhagen. 135 Gothersgade, Copenhagen, Denmark.

1892. ERNEST MUIRHEAD LITTLE, F.R.C.S., Eng., Surgeon to the National Orthopedic Hospital. 40 Seymour Street, Portman Square, London, England.

ELECTED

1889. PROF. DR. ADOLF LORENZ. IX. Garnisongasse 3 (Garellihoff), Vienna, Austria.

1889. HOWARD MARSH, F.R.C.S. ENG., Senior Assistant Surgeon and Lecturer on Surgery, St. Bartholomew's Hospital; Consulting Surgeon, Hospital for Sick Children, and Alexandra Hospital for Hip Disease. 30 Bruton Street, W., London, England.

1890. EDMUND OWEN, M.B., F.R.C.S., Surgeon to and Joint Lecturer on Surgery at St. Mary's Hospital; Senior Surgeon to the Hospital for Sick Children, Great Ormond Street. 64 Great Cumberland Place, W., London, England.

1892. PIETRO PANZERI, M.D., Direttore di Istitutio dei Rachitici, Milano. Via S. Calimero 31, Milano, Italy.

1892. ROBERT WILLIAM PARKER, M.R.C.S. ENG., Senior Surgeon, East London Hospital for Children; Surgeon, German Hospital, Dalston. 13 Welbeck Street, W., London, England.

1890. PAUL REDARD, M.D., Lauréat de l'Institut; Ancien Chef de Clinique Chirurgicale de la Faculté de Médecine de Paris; Chirurgien du Dispensaire Furtado-Heine. 3 Rue de Turin, Paris, France.

1888. BERNARD ROTH, F.R.C.S. ENG. 29 Queen Anne Street, Cavendish Square, W., London, England.

1890. NOBLE SMITH, F.R.C.S. EDIN., L.R.C.P. LOND., M.R.C.S. ENG., M.D., Surgeon to All Saints' Children's Hospital; Orthopedic Surgeon to British Home for Incurables. 24 Queen Anne Street, Cavendish Square, W., London, England.

*1890. HUGH OWEN THOMAS, M.R.C.S. ENG.

1890. W. J. WALSHAM, F.R.C.S. ENG., M.B. and C.M. ABERDEEN, Assistant Surgeon and Surgeon-in-Charge of Orthopedic Department, and Lecturer on Anatomy, St. Bartholomew's Hospital; Surgeon, Metropolitan Hospital; Consulting Surgeon to Hospital for Hip Diseases, Sevenoaks, and to the Burnley Cottage Hospital. 77 Harley Street, London, England.

1890. GEORGE ARTHUR WRIGHT, B.A., M.B. OXON., F.R.C.S., Senior Assistant Surgeon, Royal Infirmary, Manchester; Surgeon to Children's Hospital, Pendlebury and Manchester. 8A St. John Street, Manchester, England.

CONSTITUTION AND BY-LAWS.

CONSTITUTION.

ARTICLE I.—NAME.

This Society shall be called the "American Orthopedic Association."

ARTICLE II.—OBJECTS.

The purpose of this Association shall be the advancement of Orthopedic science and art.

ARTICLE III.—MEMBERSHIP.

Section 1. The members shall be graduates of regular medical schools, shall be in good professional standing, and shall be especially interested in Orthopedic Surgery.

Sec. 2. There shall be three classes of members, viz.: Active, Corresponding, and Honorary.

Sec. 3. The number of Active Members shall be limited to sixty.

Sec. 4. Candidates for membership shall have been engaged in the practice of medicine for at least five years, and shall have given evidence of satisfactory scientific attainments.

ARTICLE IV.—OFFICERS.

The officers shall consist of a President, a First Vice-President, a Second Vice-President, a Secretary, and a Treasurer, all to be elected annually at the last executive session of a regular meeting.

ARTICLE V.—STANDING COMMITTEES.

There shall be a Committee on Membership, consisting of five members, a Committee on Publication, consisting of three members, and

an Executive Committee, consisting of the President, the Secretary, and the Treasurer.

ARTICLE VI.—ELECTIONS.

All elections shall be by ballot; for officers a majority shall elect, for members a four-fifths majority.

ARTICLE VII.—MEETINGS.

The meetings of the Association shall be Regular and Special.

ARTICLE VIII.—FEES.

Active members shall pay an initiation fee of twenty-five dollars, and annual dues of fifteen dollars.

ARTICLE IX.—PUBLISHED PROCEEDINGS.

The business proceedings of the Association shall be published annually. The papers and discussions shall be published annually, unless the Association otherwise directs at the close of the regular meeting.

ARTICLE X.—DISCIPLINE.

A three-fourths vote of all members present at a regular meeting shall be necessary for suspension or expulsion of a member.

ARTICLE XI.—THE CONGRESS.

Section 1. This Association shall hold membership in and meet with the Congress of American Physicians and Surgeons.

Sec. 2. It shall, at the first annual meeting held after the adjournment of any Congress, elect a member to represent it on the Executive Committee of the Congress for the ensuing three years, and it shall also elect a second member as an alternate.

ARTICLE XII.—QUORUM.

An actual presence of nine active members at any one meeting shall be necessary for the transaction of business.

ARTICLE XIII.—AMENDMENTS.

Alterations to this Constitution may be made at any regular meeting by a four-fifths vote of all the members present; provided that notice of the proposed changes, signed by two active members, shall have been given to all the active members at least one month previous to final action.

BY-LAWS.

ARTICLE I.—MEMBERSHIP.

SECTION 1. Nominations for membership shall be made in writing, signed by the proposer and seconder, accompanied by evidence as to the fitness of the candidate for fellowship, and shall be placed in the hands of the Secretary at least twelve months previous to the time of the regular meeting.

SEC. 2. Candidates for active membership shall, through the Secretary, present a paper to the Association.

SEC. 3. Only those of acknowledged pre-eminence in Orthopedic Surgery shall be eligible to honorary membership.

SEC. 4. Foreign residents only shall be eligible to corresponding membership.

SEC. 5. All the scientific privileges of the Association shall be accorded to the honorary and corresponding members.

SEC. 6. Membership shall be forfeited when one ceases to take an active interest in the objects of the Association, or is guilty of an unprofessional act or a public misdemeanor. Action in such cases shall be taken according to Article X. of the Constitution.

SEC. 7. An active member absenting himself for three consecutive meetings, or two years in arrears in payment of dues, may be dropped from the rolls.

SEC. 8. All members in attendance at any meeting shall register in a book provided for the purpose.

ARTICLE II.—OFFICERS AND STANDING COMMITTEES.

SECTION 1. The duties of officers and standing committees shall commence after the adjournment of the meeting at which they are

elected or appointed, and shall continue until their successors are duly installed.

SEC. 2. The President shall preside at all meetings, shall deliver an annual address, shall appoint the Committees on Membership and Publication, shall fill any vacancies that may occur from resignation or otherwise.

SEC. 3. The Vice-President shall act in the absence of the President.

SEC. 4. The Secretary shall give due notice of and keep the minutes of all meetings, shall conduct all correspondence, shall notify candidates of their election to membership, and inform members of their appointment on committees, and shall perform such other duties as are assigned to him by the Association.

SEC. 5. The Treasurer shall collect all money due the Association, be the custodian of the same, and pay it out only on warrant signed by the President and Secretary. At the annual meeting he shall make a report of his receipts and expenditures, which, after being duly audited, shall be filed.

SEC. 6. The Membership Committee shall consider the eligibility of all nominees for membership, and shall report its recommendations to the Association.

SEC. 7. The Executive Committee shall make all necessary arrangements for the meetings of the Association, assign the order for scientific work, and report the same to all members as early as practicable before the time of the annual meeting; it shall further manage such necessary affairs of the Association as are not already assigned to others.

SEC. 8. The Publication Committee shall attend to the preparation, publication, and distribution of the annual proceedings of the Association; and it shall have discretionary power as to matter for publication in questionable cases.

ARTICLE III.—ELECTIONS.

Election of members shall be held at the first executive session of a regular meeting, and of officers at the last business session.

ARTICLE IV.—MEETINGS.

SECTION 1. The regular meetings shall be held annually during the third week in September of each year, or at such other time and at such place as the Association may elect. If no action should be taken in the matter, the Executive Committee shall decide.

SEC. 2. Special meetings may be called by the Executive Committee or by the President at the written request of ten active members.

SEC. 3. Every third year the Association shall convene as a part of the Congress of American Physicians and Surgeons.

ARTICLE V.—DUES.

The yearly dues shall be paid to the Treasurer at the time of registration.

ARTICLE VI.—PUBLISHED PROCEEDINGS.

SECTION 1. The Transactions shall be printed as soon after the adjournment of the regular meeting as possible, and distributed to the members, one copy to each except to those in arrears on Association dues.

SEC. 2. Additional copies of the Transactions shall be furnished to members at cost, and to the public at a price to be determined by the Publication Committee.

SEC. 3. Authors desiring reprints of their papers will notify the Publication Committee, who shall already have established rates for reprints with the publishers.

SEC. 4. Papers not in the hands of the Secretary within four weeks after adjournment of the meeting shall be omitted from the Transactions on the unanimous vote of the Publication Committee.

ARTICLE VII.—PAPERS AND DISCUSSIONS.

SECTION 1. Papers read before the Association shall be limited to twenty minutes, unless the time be extended by vote. Discussions shall be limited to five-minute speeches. No member shall speak a second time on the same subject if others desire the floor. The author of the paper shall be privileged to close the debate.

SEC. 2. No papers shall be read that have been previously published.

Members publishing their papers after they have been presented to the Association shall designate them, "Read before the American Orthopedic Association." Authors desiring their papers illustrated shall furnish the necessary woodcuts.

SEC. 3. Proofs sent to authors should be returned within a fortnight, otherwise the matter will go to press without the author's corrections. Marked changes from copy, known as "time work," shall be paid for by the author.

SEC. 4. Transcripts of the discussion shall be furnished the participants for correction, but not for re-writing.

ARTICLE VIII.—EXECUTIVE.

SECTION 1. Two executive sessions shall be held during each regular annual meeting, to wit: at noon of the first day, and at noon of the last day. The order of business shall be:

1. Reading of unapproved minutes and records.
2. Reports of officers and committees and action thereon.
3. Unfinished business.
4. Election.
5. New business.

The last act before adjournment of the last session shall be the reading of unapproved minutes and action thereon. Urgent business may be transacted at any session by unanimous consent.

SEC. 2. The proceedings of the Association shall be in accordance with parliamentary usage.

ARTICLE IX.—AMENDMENTS.

Proposed amendments to the By-laws shall be submitted in writing and signed by two active members. Previous notice of the proposed changes shall be given. A three-fourths affirmative vote of all members present at a regular meeting shall be necessary to ratification.

THE PRESIDENT'S ADDRESS.

A DEFINITION OF THE SCOPE OF ORTHOPEDIC SURGERY,

AS INDICATED BY ITS ORIGIN, BY ITS DEVELOPMENT, AND BY THE WORK OF THE AMERICAN ORTHOPEDIC ASSOCIATION.

By ROYAL WHITMAN, M.D.,
NEW YORK.

A DEFINITION of the scope of that branch of surgery known as orthopedy is the more difficult because the derivation of the term, as well as its original application by its author, Andry,[1] refers to the prevention and treatment of the bodily defects and deformities of children only.

One is obliged, therefore, to define not what orthopedy means, but what its present application has come to be. Andry is sometimes called the father of this specialty, and there appears to be a very general misapprehension as to the object and scope of his book, published in 1741, in the title of which the name "*orthopédie*" first appears. This was in no sense a scientific work, even from the standpoint of that time. It was what might be called a nursery guide; in it were considered not only the common postural deformities, but, at much greater length, external defects and blemishes, as of the hair and skin, which could not be concealed.[2] It is empha-

[1] "L'Orthopédie ou l'art de prévenir et de corriger dans les enfans les difformités du corps." (From title page.)

"Quant au titre en question, je l'ai formé de deux mots grecs, sçavoir d'orthos, qui veut dire droit, exempt de difformité qui est selon la rectitude, et de paidion, qui signifie enfant" (Andry).

[2] "Je ne considère dans tous ces articles, que les défauts extérieurs. Je veux dire ceux qu'on ne sçauroit cacher."

sized again and again by this writer, that the advice is intended only for parents and nurses,[1] and that surgical aid is required for the proper treatment of the more serious distortions, of which congenital dislocations are instanced.

The treatment of deformity has always been considered of special importance, and the subject has attracted the attention of many of those whose names are most distinguished in the history of medicine; the terms kyphosis, scoliosis, and lordosis date from the time of Galen, and suggestions of some of the forms of apparatus now in use may be found pictured in the ancient works on surgery.

At the time of Andry, and for long afterward, the treatment of deformity, of which distortions of the spine and club-foot seem alone to have received serious attention, was practically limited to the use of apparatus.

At the beginning of the present century this treatment was to a great extent carried on in special institutions, and we may assume that at this time the ancient practice of mechanical treatment began to be known as orthopedic, although the use of apparatus is hardly mentioned by Andry. Indeed, he may be considered as one of the earliest advocates of what was afterward known, in the animated discussions of the early part of the century, as the dynamic or developmental treatment, as opposed to purely mechanical methods.

Orthopedic surgery is a compound term which would seem to imply the addition of broader knowledge, and, therefore, more comprehensive treatment, to the ancient and limited practice of the early specialist.

In this broader sense the specialty of orthopedic surgery is modern, but it still feels the weighty influence of the old traditions, not only in the supposed limitations of its legitimate and necessary scope, but in the confounding of the means employed with the object to be attained. The application of a brace rather than the treatment of disease and deformity is still, in the minds of many, the distinctive and essential feature of the specialty.

The following definition, to be found in *An American Text-book of Surgery*, illustrates this point of view, and may therefore serve as a text for my remarks: "Orthopedic surgery has to do properly

[1] "Le tout par des moyens à la portée des pères et des mères et de toutes les personnes qui ont des enfans."

with the treatment of deformities and contractions, especially by some form or other of mechanical appliance; though of late its field has been somewhat extended, so as to include the consideration of many of the deformity-producing joint affections." The qualifying clause is of weighty significance, and it applies particularly to the practice of orthopedic surgery in this country, for here, where its importance has been more rapidly and generally recognized than abroad, it seems to have developed from a different standpoint, in that it was the desire to provide for the more effective treatment of the painful, dangerous, and deforming diseases of the bones and joints, now known to be tuberculous in origin, that led to the establishment of special hospitals and clinics, and thus afforded the opportunity for the study and treatment of disease and deformity, and for the evolution of the modern orthopedic surgeon.

As an example to the point, the objects for which the New York Orthopedic Dispensary and Hospital was established in 1866 are set forth as follows:

Objects of the Institution. "To furnish treatment to the poor, with special reference to the diseases and deformities of the spine and hip-joint and other of the more serious diseases of the bones and joints requiring surgical and mechanical treatment, and for giving instruction in the same."

This illustration is particularly applicable, because this institution is one of the few to which the distinctive name orthopedic was applied.

If one asks the student of to-day what orthopedic subject most interests him and of which he wishes first to learn, he will probably answer "hip disease;" and "hip disease" seems to the lay mind also to sum up in its familiar characteristics of danger, pain, and ultimate deformity, the type of the class of cases which demands that special knowledge and skill in treatment that the orthopedic surgeon is supposed to possess. Disease, then, that may lead to deformity has become of equal importance in the practice of orthopedic surgery with the treatment of actual deformity, which was originally its end and aim.

When the better knowledge of disease pointed out the varying causes of deformity, and thus the possibility of its prevention; when the standpoint was changed from the treatment of effect to the study

of cause, from an empirical to a scientific basis, the importance of deformity as an entity disappeared, and the old limitation of the specialty became intolerable and impossible.

The ancient specialist treated deformity by means of mechanical appliances; or, in the words of the definition, "orthopedic surgery has to do properly with the treatment of deformities and contractions, especially by some form or other of mechanical appliance."

When causes were unknown the manner of treatment was of greater importance than the thing to be treated, and the manner of treatment still clings to orthopedic surgery as its essential feature. One constantly encounters this traditional faith in the efficacy of a brace *per se*, and in the teaching of students one's first care must always be to attack this popular fallacy and to relegate the brace to its proper place, as one of the means to be employed in the treatment of weakness and disease, a means whose use becomes apparent only by the study of cause and the knowledge of effect.

The exaggeration of a means or manner of treatment belittles the importance of the study of cause and effect, and in so far as it applies as a distinctive and limiting principle is not only inconsistent with scientific progress, but impracticable in rational treatment; and as an apt illustration of this fact, one-quarter of the space devoted to orthopedic surgery under the definition which is the subject of this analysis, is occupied by the descriptions of spasmodic wry-neck, Dupuytren's contraction, webbed fingers, supernumerary digits, and club-hand, not one of which can be properly treated by any form of mechanical appliance.

Of the two hundred and eighty-four papers to be found in the eight volumes of TRANSACTIONS of this Association, but seventy-five are limited to the sixteen subjects that, according to this text-book, represent the scope of orthopedic surgery. Of the seventy-five, thirty-two are on club-foot alone, and nineteen of these consider its operative treatment. One must conclude, then, that this section of a modern text-book represents the orthopedic surgery of a past time —of a time when its scope was limited to deformities and contractions, and when exclusive methods of treatment were opposed to one another, even within this narrow field.

It would seem that at the present day one need not multiply arguments to prove that any exclusive manner of treatment, how-

ever useful and however efficacious it may be in its proper place, for the individual practitioner, and as applied to selected cases, must be inefficient in the larger and more comprehensive field of the modern specialty. Its shortcomings and failures can only result in the voluntary or involuntary division of patients, in the separating into groups, disabilities, diseases, and deformities that are absolutely one in cause and effect.

Those who see only the advanced and serious class advocate radical and unnecessary treatment for all, and those who limit themselves to the milder types may be ill-prepared to combat the emergencies that may arise even in selected cases, or to modify a routine to meet the individual need.

The practical effect of this division, selection, and consequently ill-rounded experience has been to create and keep alive an antagonism fostered by a quicker perception of an opponent's failures than of the merits of his treatment. That such antagonism still exists is due, no doubt, to the traditions of that ancient time when etiology and pathology were alike unknown, and when the manner of treatment was of greater importance than the unknown cause which led to the condition.

I hope it has been made clear why the definition of Andry, by which he unwittingly limited the specialty to external deformity and to the treatment of children, is no longer adequate, and why the definition quoted from a modern text-book neither properly defines the term orthopedic nor indicates the scope of orthopedic work; it has even retrograded from the standard of our ancient prototype in that it makes a manner of treatment the distinguishing and limiting characteristic of modern scientific work.

Orthopedic surgery inherits an ancient name and the traditions of a still more ancient practice, but it is no longer bound to those traditions; it no longer separates deformity from its causes, or divides it into classes to fit it to a peculiar therapeutic method; but it now maintains, in common with other specialties, that the knowledge of cause and effect, modified it may be by practical experience and the individual needs of the patient, is the only safe and enduring standard upon which treatment may be conducted.

It is a very pertinent question in this discussion why orthopedic surgery is a specialty.

We may assume that in the past, as at the present time, it is because of the universal dread of deformity; in the past, as at present, because of the necessity for special knowledge of the use of apparatus that has always entered so largely into its effective treatment.

In more recent years the neglect of the chronic and deforming diseases of the joints gave it larger opportunity, and when advancing knowledge showed the curability of what was at one time considered hopeless disease, and the possibility of preventing and checking deformity by early diagnosis and timely treatment, its sphere of usefulness was still further extended. Finally, it is the time-absorbing character of the work that demands the infinite pains necessary to make hopeless deformity tolerable, to bring chronic disease to ultimate cure, and to search out the insignificant causes that may lead to pain and disability, that make it to-day, more than ever before, an important branch of surgery.

It is the mechanical specialty, but no longer in the old and narrow sense—mechanical because it has to do directly with the human machine. One must not only know the causes of disease, but he must become an expert in the statics and dynamics of this machine if he would hope to possess that scientific imagination that may predict effect from the knowledge of cause, and, thus foreseeing, guard against it—a knowledge which is the very essence of prevention. This represents the scope and function of modern orthopedic surgery as I understand it and as it is defined by the work of this Association.

If a new definition or a new interpretation of the outgrown term orthopedic is needed, its first essential, it seems to me, should be freedom from the hampering qualifications that a former practice and tradition may have justified in the past. From the point of view that the object of orthopedic treatment is the cure or relief of the condition for which it is applied, and that the scope and compass of modern orthopedic surgery are best indicated by the work of this Association, the following definition is suggested: *Orthopedic surgery is that division of surgery which treats of disabilities and diseases of the locomotive apparatus and of the prevention and treatment of deformities of the framework of the body.*

This definition would not claim for orthopedic surgery all the surgical diseases, deformities, and disabilities whose exclusion would

burden it with qualifications. It claims for the orthopedic surgeon no special aptitude for the treatment of supernumerary digits, hare-lip, and crooked noses, which, with crossed eyes and stuttering tongue, were by Andry included under the title; but it would indicate that orthopedic surgery had especially to do with those deformities that affected the framework of the human machine, those diseases of the bones and joints that led to distortions of this machine, and those disabilities that especially concerned the functional use of the machine.

To illustrate the applicability of this definition to the daily work of the orthopedic surgeon, the following examples may be cited: Disability of the locomotive apparatus would include simple structural weakness, as well as local paralysis; it would also include the minor affections that cause pain and weakness, but not necessarily deformity, as illustrated in the TRANSACTIONS by treatment of slipping patella, anterior metatarsalgia, non-deforming club-foot, and the like. Disease of the locomotive apparatus has a wide range, from tuberculous disease, on the one hand, to the acute infectious processes of the bones and joints that demand immediate surgical interference and which almost inevitably lead to deformity, on the other.

Prevention of deformity implies not only the prevention of local deformity, the direct or indirect result of disease, but the prevention of deformity in its broader sense, by guarding the body during the growing period from the evil effects of carelessness and ignorance, as well as from unnecessary compensation for local deformity or disability.

Orthopedic treatment may be primarily mechanical and incidentally operative, as in the most important section of orthopedic work. It may be primarily operative, as for congenital dislocation of the hip; or secondarily operative, for the purpose of making apparatus unnecessary or less burdensome, as is the excision of a joint; or for the relief of paralytic deformity by arthrodesis or tendon grafting; and, finally, both apparatus and operation may be displaced in many instances by developmental training and by the avoidance of predisposing and exciting causes that would otherwise lead inevitably to weakness and disability.

As prevention of deformity is the present ideal in practice, so, other things being equal, the importance of its rapid correction is

likely to be more generally recognized in the future. As the causes of deformity become better known, the principles of treatment will become clear and definite, and the means of applying these principles more simple and effective.

As the study of human mechanics in its broader sense is so important in the practice of orthopedic surgery, so mechanical treatment was, and still is, the most important means of treatment, and that there may be no misunderstanding on this point, all that has been maintained as to the benefit and the absolute necessity of the rest, correction, and protection that may be afforded by the brace is admitted; but it cannot be admitted that the essence of orthopedic surgery is the manner by which disease and deformity may be treated, or that the orthopedic surgeon has any vital interest in the elevation of the practice of what has been called mechanicotherapy, or that this or any other useful means toward an end needs other advocacy than the evidence of its merits that advancing knowledge and practical experience shall demonstrate.

If the treatment of deformity ever fell into disrepute, it was not because of the use of the apparatus, or because of the conditions for which apparatus was applied, for this class of sufferers has always appealed to universal sympathy; it was because of the unscientific exaggeration of a means of treatment; it was because of the theory that deformity was properly treated by apparatus, and not because apparatus was properly employed in the treatment of deformity.

The contributing field for orthopedic work is large, but the varying causes lead in effect to disability and deformity; thus the specialty differs from others that are limited to special organs or tissues in that it has a broader outlook and an ill-defined boundary; but this is not a disadvantage, since the object of a specialty is not the complete separation of one branch of medicine from another, but rather to provide the opportunity for the concentration of energy in a particular direction, and thus for the addition to the sum-total of knowledge by more accurate observation, and for the acquirement of manipulative skill that can only come with constant practice. An ill-defined boundary is rather an advantage, if thus, by more frequent contact with workers in other fields, we may escape the accusation of narrowness that is sometimes urged against special work, and of the truth of which our history may furnish instructive examples.

It is not to be expected that members of this Association, attracted to orthopedic work by one or another of its many-sided aspects, who differ so widely in training, in environment, and in opportunity, will always agree, even on a common point of view. And it may be even a fortunate factor in the vigorous life of the Association that its members differ with one another not only in the interpretation of the phenomena of disease, but as to the means by which it may best be treated, and that some limit themselves, it may be, to one or another therapeutic method.

But this Association, as the representative of modern orthopedic surgery, can be bound to no exclusive method or doctrine, for its object is to bring together and to concentrate individual effort in the search for truth, wherever this search may lead. On this account, if for no other reason, its charity must be broad enough to cover all the limitations in the aims and methods of its members, that it may provide a free and open field for discussion; for it is by the contests of opposing theories and methods that the underlying principles which govern and explain all treatment will come to light and will be established.

THE RAPID CURE OF ROTARY-LATERAL CURVATURE OF THE SPINE, AND OTHER POSTURAL DEFORMITIES, BY MEANS OF THOROUGH DEVELOPMENT, AND CORRECTIVE EXERCISES WITH HEAVY WEIGHTS.

WITH A DEMONSTRATION OF THE METHOD.

By JACOB TESCHNER, M.D.,
NEW YORK.

A PAPER[1] read by me before the Orthopedic Section of the New York Academy of Medicine, May 17, 1895, was entitled "The Treatment of Postural Deformities of the Trunk by Means of Rapid and Thorough Physical Development." In that paper I outlined my views concerning the more important etiological factors in the causation of these deformities. The plan of treatment devised by me was demonstrated by patients, and nine cases were reported, five of which were presented.

The cases were: One case of very marked one-sided deformity of the sterno-costal articulations; cured. Two of firmly fixed and severe scolioses of many years' standing, with firm and resisting bony and ligamentous changes; markedly improved. And six of ordinary rotary-lateral curvatures of the spine, three of which were partially fixed; all cured.

These cases were treated for different periods—from six weeks to four months.

Since October last I have discharged twelve cases as cured. Such uniformly good results as I have obtained in a class of cases, the treatment of which up to the present time has been, at best, very

[1] Annals of Surgery, Philadelphia and London, August, 1895.

unsatisfactory in the hands of orthopedic surgeons generally, suffice to justify me in claiming the curability of these deformities. Hence the title of this paper.

I shall present to you the salient points of the treatment, and demonstrate to you the character of the work. I shall also show you the different immediate effects of the corrective exercises upon the trunk as a whole, and especially upon the vertebral column.

Believing that the most important etiological factor in the causation of these deformities is a weakened or rudimentary condition of the muscular systems generally, or of certain muscular groups in particular, I hold that all the muscles should be developed, educated, and strengthened to their fullest extent, not only in those cases where the tendencies to deformities are known to exist, but also where deformities, whether habitual or fixed are present, so that they may be cured, improved, or prevented from becoming worse.

I shall quote from my former paper:

"All orthopedists are agreed that exercises, when properly given, are beneficial, but the degree of benefit must necessarily depend upon the muscular ability and the strength and the will of the individual patient to correct, or to partially correct, a faulty attitude or deformity.

"In considering the question of muscular development, I wish to state that I have renounced and discontinued all supporting and immobilizing appliances, as described in my paper,[1] in any and all cases which I consider amenable to treatment.

"The objection to all supporting appliances is that each and every one will, to a greater or less extent, interfere with the mobility, and in that manner deprive the back, chest, and abdominal muscles of that perfect freedom of action which is a necessary and powerful adjunct in the successful treatment by gymnastics. In the treatment of deformities the aim is and has been to correct the deviations from the normal by such exercises as will educate the different groups of muscles to sufficient and proper exertion, to enable the patient to assume as nearly as possible a normal attitude. This muscular education is dependent upon strength and development, without both of

[1] Observations on the Rotary-lateral Curvature of the Spine, with Special Reference to the Etiology and Treatment. Read before the Surgical Section of the Pan-American Medical Congress, at Washington, D. C., September 5, 1893. Medical Record, December 16, 1893.

which we must largely fail to obtain that proper and vigorous muscular action upon which any beneficial results from corrective exercises must depend. Therefore it is necessary and imperative, in all cases which require or are amenable to treatment, to attain the highest type of development possible of the entire body, to render the spine mobile in all directions, and also to develop the full strength of each patient. Individual work only can accomplish this, and because it is of the highest importance to carefully watch every movement of the patient and to immediately correct any and all errors in attitude, deportment, or exercise.

"The important points to be observed in the development of strength and muscle are correct attitude, ease and grace and rhythm of motion, an automatic and independent and full action of only those groups of muscles which are called into play by the performance of each separate exercise, and each group of muscles automatically exercised until it is thoroughly tired. No muscle can be properly developed unless it is tired by frequent and uninterrupted automatic contractions and relaxations.

"All exercises with light weights should be executed in a closely-fitting jersey suit before a mirror, so that the patients can hold themselves in the proper position while going through the different movements. By doing this they can see when the position is faulty, either by reason of a sagging of the trunk or through the lack of co-ordination of all those muscles which are to remain fixed while certain groups are in action, and they can correct their faults. It also materially assists in the acquisition of grace and ease in working automatically. Exercise in this manner brings about a forced and habitually corrected pose and carriage while the strength and muscles necessary to maintain a correct position are being developed.

"Taking the standpoint that

"1. Lack of strength and lack of muscular development;

"2. Habitual faulty position with superimposed weight; and,

"3. Lack of co-ordinating power or lack of muscular control are the more potent etiological factors in producing deformities, it is and has been my aim—and I believe that I have succeeded in correcting deformities by reversing these conditions—that is:

"1. By developing the muscles and their strength;

"2. By acquiring an habitually corrected position with superimposed weight; and,

"3. By educating all the muscles to proper co-ordination and to complete control.

"A pair of dumb-bells weighing from one-half to five pounds are used in a series of twenty-six exercises for the development of the muscles."

In addition to these development exercises I give the patients work with heavy bars and bells at each visit to my office. The weight of the bars and bells and the number of times that each heavy weight or pair of weights is handled depend upon the strength, capacity, and upon the endurance of the individual. It is my practice to put each patient to his or her individual limit of work at each visit, and that limit is invariably extended at each succeeding visit, unless the patient is indisposed. The strength and endurance, as shown by the amount of weight handled, the number of times each weight and set of weights is handled, increase very markedly in every case from one visit to another. This increase is largely dependent upon correctness of posture and precision in the work. This is a matter of record in all my cases, as I keep a tabulated statement of all the work, designating the weights used and the exact number of times each exercise has been performed. This heavy work develops the strength to its fullest extent, and it is by means of this work that I have been enabled to correct severe deformities even where bony and ligamentous changes and marked rotation were present. This is my corrective work, which I will demonstrate.

Bells weighing from five to eighty pounds each, and steel bars and bar-bells weighing from twenty-six to one hundred and eleven pounds are used in different ways. Bells are pushed from the shoulders above the head alternately as often as the patient can. The patient is instructed to swing a heavy bell with one hand from the floor, above the head and down again, the elbow and wrist being fixed and the motion repeated as often as possible in a systematic manner; then with the other hand the same number of times, and later with both. This exerts all the extensor muscles from the toes to the head in rapid succession.

When a heavy ball is pushed or swung above the head on the side

opposite the scoliosis the action of the back muscles, to sustain the weight and equilibrium, is such as to cause the curved spine to approximate a straight line. A similar result is produced when a heavy weight is held by the side of the erect body on the scoliotic side, the arm being at full length.

When a heavy bar is raised above the head, with both hands, the patient must fix the eyes upon the middle of the bar to maintain an equilibrium. This necessitates the bending of the head backward, the straightening and hyperextending the spine, and consequently correcting a faulty position with a weight superimposed. The heavier the weight put above the head, whether with one hand or with two, the more the patient must exert himself or herself to attain and maintain a correct or an improved attitude in order to sustain the equilibrium. (By an improved attitude I mean the greatest amount of correction of the deviation of the spine that the fixation of a deformity will allow of.) Hence, the greater the weight the more forcible the actions of the muscles become, and the greater the temporary reduction of a deformity. It is by means of frequent and forcible temporary reductions of deformities by voluntary muscular actions that we can hope to improve and do improve those cases which are amenable to any form of active treatment.

When a patient, lying supine upon the floor, raises a heavy bar above the head so that the arms are perpendicular to the floor, the weight of the bar, the position and weight of the body, and the action of the muscles tend to broaden the entire back and shoulders, and a slow downward movement tends to widen the entire chest, and most markedly the shoulders. The frequent repetition of the upward and downward movement plays an important part in the rapid development of the chest and back. Pushing the bells above the head, swinging them with each hand apparently and with both hands together, raising a bar above the head, standing and lying down, and the exercises before enumerated, constitute one day's work.

As the amount of work performed by a patient depends upon the last previous record of that patient, that record must be improved upon at each succeeding visit, unless there be a good and sufficient reason to the contrary. Most patients can well stand three treatments a week. In mild, habitual cases improvement in deportment is noticed by the patient's relatives and friends and by the patients themselves

within the first two weeks. In those cases two months' treatment usually suffice to effect a complete cure. In the more severe cases it is not and cannot be expected to attain such rapid results, but a certain appreciable improvement is effected, and the amount of improvement depends upon persistent continuance of the treatment. Where there is a fixed rotation of long standing, with bony and ligamentous changes, the prospects are not so good; but even in those cases I am sure that I have shown considerable improvement in their conditions.

Patients are not permitted to wear supports of any kind, not even corsets. They should not exercise until at least two hours after a meal, nor when menstruating. The general health is improved by the exercises, the patients gain in height and weight. The girths and breadth measurements, chest depth, strength-tests, and lung capacity are generally increased, and the depth of the abdomen is usually decreased. In some cases, especially those of undersized patients, the increase in height is very rapid, and it is certainly more than the increase by ordinary growth. There were marked cases of flat-foot which were benefited, as will be seen by reference to the charts.[1] The flat feet became shorter through the exercises by the increase in depth of the inner arches.

This system of work should only be applied by the physician, and he must himself have been trained to the work to intelligently guide those whom he seeks to benefit. The work must be careful, systematic, and regular. Perfunctory work will not do.

To justify the title of this paper—*i. e.*, "The Rapid Cure," etc., I point to the results that I have attained (of twenty-one cases treated, nineteen discharged cured, and two very much improved when treatment ceased), and I wish to report one case (with photographs) of marked deformity in which an almost complete obliteration of that deformity was obtained after three weeks of treatment.

Several of the gentlemen present saw her at a meeting of the Metropolitan Medical Society of New York at my residence in March last.

B. B., aged fifteen years, February 12, 1896. More than a year ago the mother noticed that the patient stooped, and attributed that

[1] See Annals of Surgery, August, 1895.

attitude to carelessness. About two months ago the mother noticed that the left hip was much larger and higher than the other. For the past few weeks the patient has complained of severe backache, so that she was uncomfortable in a sitting position. The patient was examined by Dr. I. Oppenheimer, who referred her to me for treatment.

FIG. 1.

Before treatment, February 24, 1896.

Her menstruation is regular, but she complains of severe dysmenorrhœa, which compels her to take to her bed for a few days at the appearance of each menstrual period.

Examination. Patient is intensely anæmic. There is a marked lumbar C-curve to the right, the greatest deviation being one inch from the median line (plumb line). Both scapulæ are prominent, the right more than the left. Ilio-costal curve well marked on the right

FIG. 2.

March 25, 1896, after eighth treatment.

side, obliterated on the left. Patient has marked abduction and pronation of the right foot, with occasional pain. There is no spasm Wears the sole and heel down on the inside.

Chicken breast, large depression below clavicles; stoop shoulders

well marked; right shoulder higher than the left, and head very poorly poised. Patient has about ten degrees of rotation.

Ordered the shoe of the right foot to be built up one-quarter of an inch on the inside of the sole, and advised developmental and corrective treatment.

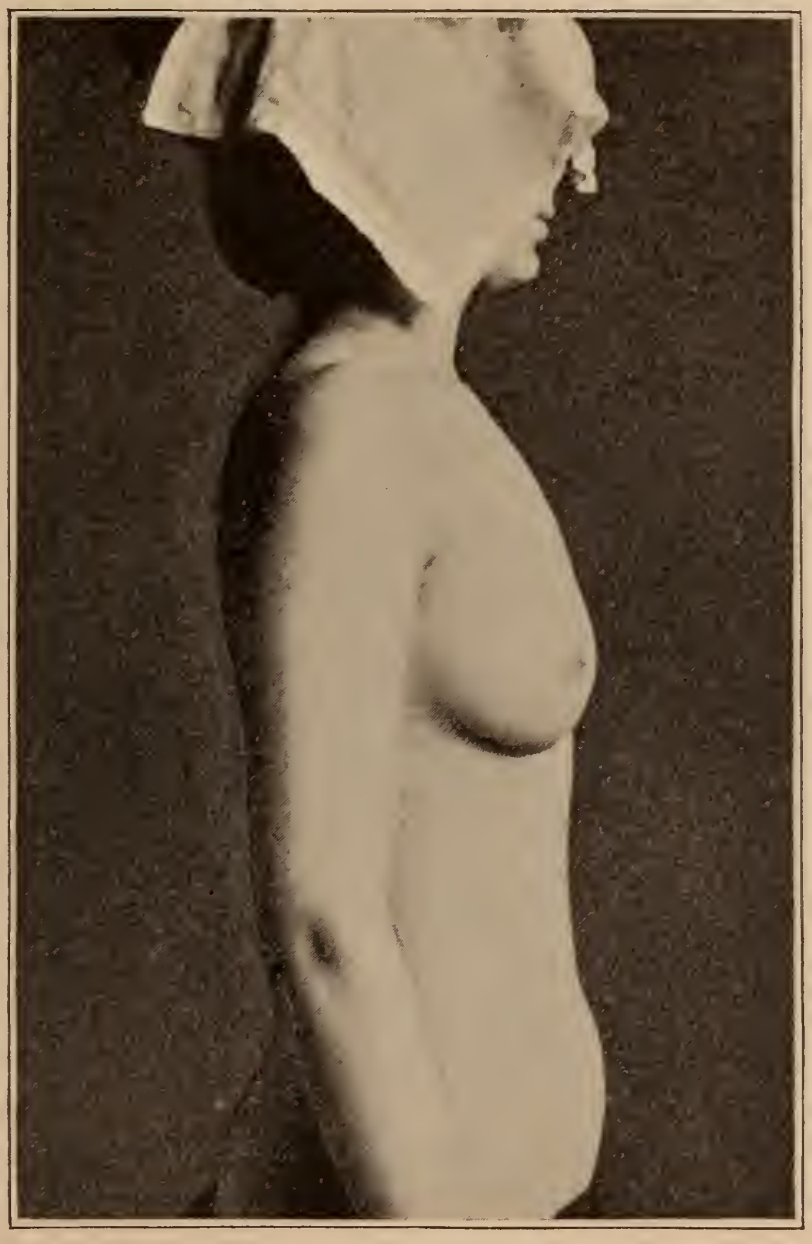
FIG. 3.

Profile showing eminence at upper portion, indicative of rotation, February 24, 1896.

February 24*th.* Patient menstruated last week, with great suffering for about ten days. She begins treatment to-day; is extremely weak and very awkward. (Patient fainted twice while being photographed.)

March 11*th*. Examination of the patient after her eighth treatment (a little less than three weeks after treatment was begun) shows the deformity almost obliterated. (See photographs.) There is no deviation of the spine, the scapulæ are not prominent, the ilio-costal

FIG. 4.



March 25, 1896, after eighth treatment, showing disappearance of rotation.

curves are about equalized, the shoulders are of equal height, the rotation of the spine has disappeared, and the right foot is no longer abducted.

18*th*. Patient menstruated last week without the slightest pain, recovering fully in four days.

April 18*th*. Patient began to menstruate on April 11th, and the flow continued until the 15th, normally and without pain.

The patient was discharged as completely cured on May 2d, after twenty-six treatments.

FIG. 5.

Showing the contracted chest and prominence of the left hip, February 24, 1896.

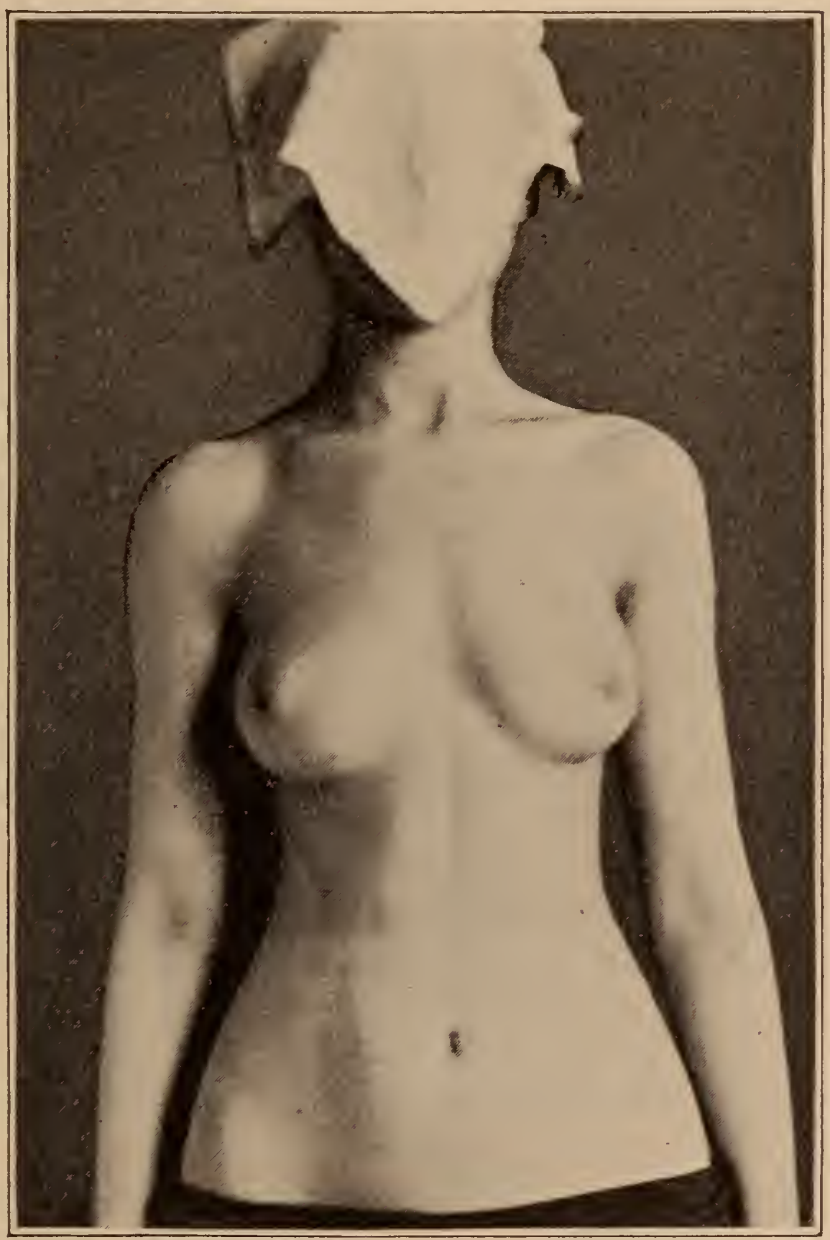
In closing I wish to call your attention to certain facts which I have observed in the treatment of my cases, and which should commend this system to the preference of all other methods.

1. It is rapid; improvement being noticed by the patients, their

relatives, and myself within one week or ten days after treatment has begun.

2. The improvement in general health and the increase of weight.

FIG. 6.



Showing improvement in the conformation of the chest and the equalization of the ilio-costal curves, March 25, 1896.

3. The wholesome effect upon the nervous system by the cultivation of muscular precision and endurance.

4. The marked increase in the lung capacity.

5. The beneficial effect upon the heart's action, as shown by the

diminished frequency of the pulse and the increase of pulse-pressure after each treatment, as shown by Basch's sphygmomanometer.

6. That all the patients continue to improve generally and muscularly long after active treatment has ceased.

In defending this heavy work against the adverse criticisms of those who might condemn it, either from their hearsay knowledge of its baneful effects or from their own observations of athletes who have been "trained down" for special work, I cite the following facts, viz.:

The general health has been good. The heart's action became more vigorous, as shown by the diminished frequency of the pulse and the increased pressure, as shown by Basch's sphygmomanometer.

The weights, chest capacities, chest depths, girths, breadths, and strength-tests are generally increased, the abdominal depths are decreased, and the feet, the foundation of correct posture, are improved, inasmuch as all flat feet become shorter, and the normal feet grow.

All this should prove that they are not overworked.

DISCUSSION.[1]

[At the suggestion of Dr. R. H. Sayre, the pulse and pressure of pulse were taken before exercising and after the young man had rested for twenty or thirty minutes at the conclusion of the demonstration. Before the exercises the pulse was 60 and the pulse-pressure 165 mm. of mercury; after exercising and rest the pulse was 96 and the pulse-pressure 210 mm. of mercury.]

Dr. S. Ketch, of New York, said that he agreed with Dr. Weigel in regard to most of the points made in his paper, except possibly as to the effect of will-power. There were undoubtedly cases of faulty position in which the calling the attention of the patient to the wrong position is likely to produce some benefit.

[1] The MS. of Dr. L. A. Weigel's paper on "The Rationale of Gymnastic Exercise and Pressure-correction in the Treatment of Scoliosis" was not received up to date of printing the Transactions, and for that reason was omitted.

He had heard Dr. Teschner's original paper read before the Orthopedic Section of the Academy of Medicine, and while he was impressed with the author's enthusiasm over the subject, he felt that he could not now express different views from those given at that meeting. As he understood the method, it was that of Atilla, an athlete, for the rapid production of strength. Atilla claimed that he could make a strong man of anybody in a comparatively short time. While personally he believed that certain of these exercises were excellent when adapted to a specific purpose, he still did not feel satisfied that it was necessary for a young child or adolescent to be put through such a severe course for the purpose of obtaining an amelioration or a cure of lateral curvature. Dr. Teschner claimed that there was an increase of the general strength, and that there was a general improvement. It was easy to understand how this might be with some patients, but he was sure that under certain circumstances it might be very dangerous. It was quite probable that it might prove dangerous to the heart in some instances. The cases improved in this way by Dr. Teschner, he believed, could be cured just as well by other means. The only difficult cases to cure were the *rotary* lateral curvatures. The changes which take place in this idiopathic form of lateral curvature, he believed, began very early in life, and consist chiefly of changes in the bones and in the ligaments. It is not a difficult matter to secure an improvement in almost any case of lateral curvature by correcting the compensatory curves, but the only proper test of benefit or cure, in his opinion, was the removal or amelioration of the element of rotation.

He thought we should endeavor to secure by exercises an increase in the lateral flexibility of the spine. It was well known that one of the tests for the amount of rotation was the estimation of the lateral flexibility of the spinal column. Dr. Teschner claimed that he could improve this element in a very short time. In his own experience this had not been the case. It was important to maintain this increased lateral flexibility. To do this he believed it was necessary to use some form of apparatus, differing in individual cases. The mistake was often made of considering apparatus an active agent, whereas it should be looked upon as only a retentive appliance. This apparatus should be capable of modification from time to time to fit the improvement in the position. A combination of

the milder gymnastic exercises, which seek to relieve the intrinsic muscles of the spine with some retentive apparatus, seemed to him the best method of treatment. He did not wish to be understood to have said that Dr. Teschner did not think he had done what he claimed, but it was to be remembered that these cases should not be finally judged until a much longer time had elapsed after treatment.

Dr. John Ridlon, of Chicago, said that he had been much interested in this paper. When he had first read the report of the original paper of Dr. Teschner he had begun the same treatment, applying it first to a girl aged sixteen years. She had been having exercises for about six months, much of the time daily, before she had attempted the use of dumb-bells and heavy work. He gave her wooden bells weighing one and a half pounds, for the regular exercises, yet he found that she was greatly fatigued after ten or fifteen movements, and he was unable to get her to put up a larger weight than a five-pound bell, and only about five times at that. This treatment was continued for four or five weeks without any material increase in strength. He could not explain this, but he abandoned the treatment after that.

Referring to some of the photographs presented, the speaker said that in one set of photographs he could not feel sure that there was any curvature in the spine over and above what was possible had the boy been manipulated into position and made to retain this while the photograph was taken. Taking a photograph or making a measurement with the patient in the so-called habitual position, generally means taking them in the worst possible position ; this was the tendency of all observers. Similarly, the tendency was to make the photograph appear as well as possible after the treatment. These points seemed to be well illustrated in the photographs of the girl with the pencil line down the spinal column. It appeared to him that in the first instance the pencil line was more crooked than the spinal column itself, and that in the photographs taken after treatment the pencil line was straighter than the spinal column. He would criticise all these photographs in this way. There should be two photographs taken before treatment—one in the habitual position, and one in the best position that the patient could be manipulated into and made to maintain for a short time. Roth claimed

that to make a patient habitually maintain as good a position after treatment as could be maintained for an instant only before treatment was all that could be expected. Referring again to the photographs, the speaker said that, in bringing the spine nearer to this line, a part of the body had been shoved to one side. The photographs showed increased muscular development, but he could not say from looking at these photographs that the curves had been corrected, and he did not think the photographs did justice to Dr. Teschner, for the reason already given. Again, there were no photographs here showing a cured case, so that we were not in a position to understand just what the reader of the paper meant by a "cure." In the patient who demonstrated the exercises here, the result was satisfactory. Roth claimed beautiful results because the majority of of his cases had no more rotation than in the normal spine. Roth claimed that true rotation, "osseous deformity," could not be eradicated by exercise. Dr. Ridlon said that his own experience had been that the patient's limit of strength could be secured in three months of faithful work, and that they lost some strength after discontinuing exercises, whether or not retentive appliances were used. Dr. Teschner should produce also records showing the number of times the weight could be put up at the completion of the treatment, and also several months later, so as to determine whether or not the patient had lost strength. If we could accomplish by this method in two months or less what we had been doing only after three or four years by the other forms of exercise, it was certainly worth knowing. He could not see, however, why this heavy exercise should increase the flexibility of the spine more quickly and more readily than the mild exercises; indeed, he would rather expect that light exercises, with the muscles not extremely tense, would be more successful in this respect.

Dr. Reginald H. Sayre, of New York, said that he would differ with Dr. Weigel in a few points only. He certainly thought that the development of the will-power in many cases of lateral curvature was of much benefit.

Dr. Weigel (interrupting) said that he had said that when the bony changes had taken place the will-power of the patient was not

capable of affecting it. He also believed that the will-power was of service in correcting faulty attitudes.

Dr. Sayre (continuing) said that the development of the will-power, by holding the patient in a correct attitude, was very essential. He did not think that the development of one set of muscles necessarily meant a lack of development of other muscles. The case quoted of the girl bicycle-rider was one in point. The apparent lack of development of the muscles of the upper extremity was probably due to contrast. He could not accept the statement that the development of one part of the muscular system must be at the expense of the rest. He would agree with Dr. Weigel regarding the other points made. He did not think that increase of the muscular power was the sole object to be achieved in the treatment of lateral curvature. The development of muscular power was only one of the means at our command for the correction of any individual case.

He understood Dr. Teschner to say that he thought the use of supporting apparatus should be abandoned in all cases of lateral curvature. If he had understood him correctly, he must take issue with him on this proposition, for there were, in his opinion, a large number of cases of lateral curvature which could not be as well treated without mechanical appliances as with their aid. Some muscles could be developed, and others could not. If we could, by giving increased work to the patient's muscles, always make them grow, there would be no cases of paralysis in the world. There were pathological processes which caused weakened muscles, and which could not be improved. A fairly large number of cases of lateral curvature were due to pathological changes in the nerve supply of some of the muscles of the body. Dr. Teschner had propounded the proposition that in proportion to the amount of weight raised was the spine pushed in the normal direction. Carrying out this line of reasoning, we only had to increase the weight indefinitely to straighten the spine until it assumed a perpendicular position—a condition which all would admit was impracticable. He had understood Dr. Teschner to say that of his twenty-one cases, nineteen had been cured, and yet he had not presented photographs of these nineteen cures. So far as he knew, in the history of lateral curva-

ture, no cures had been reported of bony distortion; hence it was particularly unfortunate that these photographs had not been produced. If it were a fact that bone changes could be made to disappear simply by muscular exercise, it was a wonderful scientific fact, and one hitherto unknown. It should, therefore, be placed on record in an indisputable form. Until such evidence was forthcoming he could not but express his doubts as to the kind of cure meant. Personally, by "cure" in lateral curvature, he meant a restoration to normal of the equilibrium between the two sides, so that to all intents and purposes the person was symmetrical on the two sides of the body. This term "symmetrical" was, of course, used in its ordinary acceptation, admitting that every individual presented certain departures from a strict standard of symmetry. For the development of muscles, for the building up of the physique, and the making of strong athletes, he thought that the exercises demonstrated this morning were very well-adapted. For the building up of the general muscular tone, so essential in many cases of lateral curvature, it seemed to him that the exercises were well adapted, although he believed that the putting up of the very heavy weights in fragile people was a mistake, and that safer and equally beneficial methods could be employed. He did not think we could be successful in our treatment of lateral curvature in a large proportion of cases without the use of supporting apparatus. If the man presented this morning was considered one of lateral curvature he would take exception to this; it was rather a case of stoop shoulders. The photograph certainly showed this. If the cases of lateral curvature reported in the paper were of this kind, it was not the kind which he was discussing. The proposition that patients after this mode of exercise continue to improve more rapidly after the exercises cease than while they were kept up, was certainly at variance with general principles. The boy shown in New York before the Orthopedic Section did very much better work at that time than he did six months later when presented before a private medical society, and when he had been out of training for some time. This is the ordinary and natural outcome of the discontinuance of treatment.

Dr. A. J. Steele, of St. Louis, said that he had been much pleased with Dr. Teschner's demonstration this morning, and he

believed there was something in it. He hoped the doctor would persevere in his methods, provided no harm would result by so doing. His proposition to select a patient, twenty-six years of age, with marked deformity, and submit this case before and after treatment to four judges, was a fair one, and the opportunity should be embraced. He disagreed with Dr. Weigel in the thought that the spine could not be rendered flexible by forms of apparatus in conjunction with exercise. The spine could be so made flexible, and then a plaster-of-Paris or leather jacket could be applied with good results. We can prevent deformity by these jackets, and then by the additional means of exercises and pressure we could probably accomplish as much as was possible in the present state of our knowledge.

Dr. Harry M. Sherman, of San Francisco, said, regarding Dr. Weigel's remarks on the etiology, that he thought we all agreed with him that the superincumbent weight was the chief factor in the production of deformity. But why should there be in the body a bone abnormally weak? In early life where there is bone deformity, there is usually rhachitis. He had lately been studying the scoliotics under his care to ascertain if they had had rhachitis in early childhood. His idea was to ascertain whether these girls, who develop scoliosis at the age of fourteen or fifteen, had not been examples of slight rhachitis in infancy. The photographs presented by Dr. Teschner were incomplete, some of the cases only being represented by photographs after treatment. Case No. 9, however, was represented by photographs taken before and after treatment. It was a case of curvature in the dorso-lumbar region. He would ask if this were really one of scoliosis at all. The only testimony as to the improvement in Dr. Teschner's cases were the tracings taken by different men. At first sight it would seem that this was a very fair way; but, on second thought, it seemed to him that it introduced an element of error—the personal equation which comes in from the slight variations in measurements when taken by different persons. The speaker said that he had been interested in the matter of using mirrors as guides for those performing gymnastic exercises. He had used these mirrors, and thought them useful. He would like to ask how much these patients were allowed to attend school.

Dr. A. E. Hoadley, of Chicago, said that for the last three or four years he had been watching to ascertain what was the effect of cellular tension on the development of scoliosis. He had come to the conclusion that it was the prime factor in the development of these conditions. What was ordinarily called "debility," he believed to be due to "minus cellular tension." It is not a question of lack of muscular balance or of ligamentous resistance. The intervertebral disks represent one-fourth of the spinal column, and where these disks had deficient cellular tension they would become depressed, as shown by the shortening of the person's stature. He had found that the greatest shortening of this kind in a young person was one and one-eighth inches between the time of rising in the morning and going to bed at night. This one-inch-and-an-eighth shortening must relax the ligaments of the spinal column to that extent, thus allowing the spinal column to float off from one side to the other, or, in other words, to rotate until it reaches a point of resistance. This, in his opinion, was the beginning of the deformity of spinal disease. He had found this shortening in all the cases. He had measured other healthy and active persons, and had found that the difference in stature during the day was not more than one-fourth of an inch. When the shortening exceeded half an inch, deformity was invited, because the ligaments which sustain the column in position without muscular action are thereby relaxed. He had, therefore, reached the conclusion that we must cure the deformity before we removed the cause. He believed that if muscular tonicity were rapidly developed it would interfere with the correction of the deformity, and, in many cases, make it impossible.

Dr. W. E. Wirt, of Cleveland, said that on examining Dr. Teschner's photographs he had been considerably disappointed to find that great cures were not there. He agreed with Dr. Teschner regarding the increase of flexibility from the use of these heavy weights, for in this way the centre of gravity is modified, and the muscles must force the spinal column into positions which will maintain the centre of gravity. This meant the exercise of a great deal of force. Dr. Teschner had stated that out of twenty-one cases, nineteen had been cured. On the other hand, in replying to Dr. Ridlon, he said that there were no cures represented in the sets of

photographs, yet the speaker had found on examining them, that they represented seven cases. He would like to have this discrepancy explained. He thought Dr. Teschner was on the wrong track when he pinned his faith entirely on one method.

Dr. Hanna, of Oberlin College, said that the gymnast would say that muscular education depended upon brain education. She had been in Oberlin for the past ten years, and in that time had examined 2300 young women. She had, of course, met with a number of cases of lateral curvature. Her treatment had been by gymnastic exercises. Instead of forcible manipulation, she preferred massage. She also used the hot and cold douche, and paid as much attention to the front of the thorax as to the spinal muscles. According to her experience, anybody with deficient muscular power could be brought up to the proper standard in about three months.

Dr. E. H. Bradford, of Boston, said that unfortunately he had not heard the papers on this subject, but every new suggestion was of value. In discussing lateral curvature it seemed indispensable to have accurate means of recording our observations. Photographs were very fallacious, and the same might be said of tracings and measurements by the lead. Before this Association attempted to pass judgment on results, the members should agree upon what were proper measurements and proper evidences of cure. In the early cases one method would be applicable; in the later stages another method would be required.

Dr. Weigel, in closing, said that his personal views had been pretty thoroughly presented in his paper this morning. The question of mechanical support was one of individual opinion and preference. Those who used it of course believed that their method had a rational basis. He sometimes went so far as to allow his patients to wear a support even at night when the superincumbent weight had been removed. He would take the risk of producing what had been claimed would follow from the use of such supports—a decrease in the muscular power. Personally, he did not believe that the disadvantages of mechanical supports were as great as had been claimed. Regarding Dr. Teschner's paper, he said that the author had stated

that the improvement was very rapid, from visit to visit, and that this was a proof of absolute muscular strength. It seemed to him that the muscles did not grow strong so rapidly as this; it was much more probable that the apparent improvement was due to increased dexterity. Girls who grow at all rapidly developed lateral curvature, were poorly nourished, and their deformity was the result of this rapid growth. In these cases there was an inherent weakness in the bones themselves as well as in the muscles.

Dr. Teschner, in closing the discussion, said that he did not take photographs of all his cases, for he did not believe that photographs of the mild postural scoliosis, even though there were a certain degree of rotation, were of any value. He had made no attempt to place the patients in a special position, but had merely told them to stand before the screen and be photographed. He would like to call attention to the photographs which had been criticised by Dr. Ridlon, particularly those in which there was said to be a deviation of the pencil line. He had marked with an aniline pencil each particular spine, and had connected these points. The slightest alteration in the patient's position would naturally make an alteration in this line, and this would explain the irregularity observed. The second picture showed not only that the patient had stooped shoulders, but also that there was rotation. The same evidence was shown in the next picture. This patient had been absolutely unable to stand in such a position before the treatment, and the fact that the photograph shows that she could do so now was sufficient proof of improvement. The case criticised by Dr. Ridlon was discharged May 2d, and the photograph, as could be seen, was dated March 25th. He did not present the young man this morning as a case of rotary lateral curvature, but as a marked example of stoop shoulders which had been cured. He still maintained that supports were of no value in cases which which were amenable to active treatment; other cases, of course, could be materially assisted by supports. The young man presented this morning had had a very decided left knock-knee and flat-foot. He now calls attention himself to the fact that this condition has been greatly improved. If such changes could be produced in the knee-joint we could certainly achieve the same result

by heavy exercises directed to the spinal column. As to the boy in New York City having lost ground since discontinuing the exercise, he must differ with Dr. Sayre. The boy had forgotten his exercise, but his physical condition was very decidedly better than it had been a year before. He handled much heavier weights than he had done on the first occasion, and this, together with his having forgotten the exercises, no doubt explained the awkwardness which he exhibited. He believed that superincumbent weight played a large part in the etiology of these deformities. He forced his patients to assume the correct posture with the heaviest weight they could bear superimposed. Regarding Case No. 9, which had been referred to by Dr. Sherman, the speaker said that after five weeks of treatment the girl was shown in the photograph perfectly straight, except a well-defined scoliosis with bony change. She was treated subsequently until this had entirely disappeared. Regarding the matter of attendance on school, he said that he preferred to have them remain away from school, if possible, for the first month. Dr. Ridlon had abandoned the treatment after trying it in one case. Even as well known a gymnast as Dr. Sargent had found it necessary to come to the speaker and personally examine the method before he had felt competent to give it a fair trial. He could not understand why the girl treated by Dr. Ridlon could not use the five-pound bell, for he could get that much work out of a child of four or five years. He would admit the inaccuracies of his records, as of all known methods of recording lateral curvatures, but they were the best under the circumstances. He had selected Drs. Whitman, Gibney, Ketch, and Judson as the four judges, whom he desired to make separate and independent examinations, before and after the treatment of the test case to which he had already referred. This, he felt, would be a fair and proper test of the method. In answer to Dr. Weigel's criticism, he would say that he did not believe that the increased work from day to day necessarily indicated muscular strength, but it certainly did indicate increased muscular ability, co ordination, and endurance.

SPONTANEOUS DISLOCATION OF THE HIP-JOINT.

By WILLIAM J. TAYLOR, M.D.,
PHILADELPHIA.

Spontaneous dislocation of the hip is extremely rare, and when it occurs is usually a result of inflammatory changes in the joint, as in fevers and other wasting diseases. There are, however, a number of instances recorded by writers where individuals have had the power of producing a dislocation at will; but these have all been in persons who have had a dislocation produced primarily by violence, and the ability to dislocate the joint spontaneously has been a secondary accomplishment.

Spontaneous dislocation of the hip which did not become manifest till six months after the receipt of an injury is, therefore, of such extreme rarity that I need make no apology for describing somewhat in detail the following case, which was seen at the clinic of the Orthopedic Hospital. Of the accuracy of the diagnosis there can be no reasonable doubt, for the case was examined repeatedly by several men of large experience as well as by myself.

M. G. S., aged twenty-one years, a violinist, applied to the clinic for relief from increasing disability in the left shoulder-joint. Two years before he received a slight injury to the left shoulder, and a small black and blue spot soon appeared over the head of the humerus, which was slightly tender on pressure, and he concluded it was only a bruise, as he had no pain whatever. In about a year he noticed that his left arm became very tired if he played his violin for any great length of time, and this disability increased to such an extent that for two months he has been unable to use the arm at all. There was increasing disability in the arm and shoulder, but at no time had there been the slightest pain on movement; at

night, however, when in bed, he could not lie upon the shoulder without discomfort. The shoulder-joint on the left side was completely anchylosed.

There is no family history of tubercular trouble, and his brothers and sisters are healthy and his mother and father are well and strong.

He is a healthy-looking young man, who states that he has never been sick a day in his life, but has been lame since early childhood. When five years of age he was sliding down some steps, when he fell and injured himself so severely that he was picked up unconscious and carried into the house. By the next day he played about as usual and was not aware that he had injured his hip in any way, for there was no pain whatever in that joint. In the course of six months he began to show signs of lameness, at first merely a slight limp; and this gradually increased until there was a marked difference in the length of the two limbs, but at no time was there pain or special discomfort in the hip-joint, in the knee of the affected side, nor indeed in any portion of the limb. He was taken to an institution for the treatment of deformities, where he was told he had hip-joint disease, and a brace was applied, which he wore for a year or two. During all the time he was under treatment for this supposed hip-disease he had no pain whatever, was never in bed, nor was he ever prevented from walking about and playing as did the other children.

A careful examination disclosed a typical dislocation of the hip-joint, in which the head of the bone was resting upon the dorsum of the ilium, where it was fixed in its new position, and there was absolutely no motion in the hip-joint. The head of the bone could be distinctly outlined, and there was no evidence whatever of shortening of the neck of the femur or of any destructive inflammatory changes in the bones, such as would be found had the condition been that of hip-joint disease.

Stimson and Hamilton in their works on dislocation, especially the latter, mention individuals who have had the power to dislocate and replace the hip-joint at will, but these have all had a dislocation produced primarily by violence, and it has only been after their recovery that this extraordinary power had developed.

Here there was no evidence of a primary dislocation at the time

of the fall, as was evidenced by the ability to walk and play within a few hours of the receipt of the injury, nor was there any history of true hip-joint disease, nor has there been any history of typhoid fever, rheumatism, or, in fact, of any illness such as would under ordinary conditions tend to permit of a spontaneous dislocation of the joint. At the time of the accident some violence must have been done to the joint and a low grade of inflammation set up which was sufficient, in the course of time, to have produced an excessive amount of fluid and an overdistention of the capsular ligament. This stretching of the capsule permitted the head of the bone to slip out of its socket, and a spontaneous dislocation was the result.

Bonnet and Parise (Stimson, *Treatise on Dislocations*, 1888, p. 114; I have been unable to consult the original) showed that by forcible injection of liquid into the cavity of the hip the articular surfaces could be separated for a distance of from one-eighth to one-quarter of an inch, and that the injection caused the limb to become flexed, which thus relaxes the Y-ligament. If the capsule is filled with liquid the head of the femur can leave the cotyloid cavity without creating a vacuum, for the liquid takes its place, and thus a great obstacle to dislocation, atmospheric pressure, is removed.

Stimson states further that these dislocations are always backward upon the dorsum of the ilium, with inward rotation.

This young man had unusually insensitive joints, as was shown by the small amount of pain which he suffered after he had been etherized, and the adhesions of the shoulder thoroughly broken up, for he had only slight discomfort in the shoulder for a few hours, and by the morning of the second day he was able to stand pretty rough handling without admitting that he suffered any pain.

If this same condition of affairs pertained to the hip-joint, it can readily be supposed that a considerable amount of inflammation, quite sufficient to have produced an outpouring of joint fluid, could have existed without his being disabled, and without causing him any suffering. The condition of the hip was of such long-standing and the adhesions so firm that it would be, I thought, unwise to attempt reduction of the dislocation or even to break up the existing adhesions. With the aid of a high shoe he was able to walk with comparative comfort, and, as his occupation is that of a violinist, he is not prevented from earning his living. The greater trochanter in

the left or dislocated side is four and one-half inches higher than on the sound side.

Dr. Fred. D. Lente (*New York Journal of Medicine,* 1851, N. S., vol. vi. p. 316) records the result of a post-mortem examination of a hip-joint which had been dislocated spontaneously, the only one which I have been able to discover in the literature of the subject, in the case of a young man of twenty-one years of age, of a hemorrhagic diathesis, who had profuse suppuration in the thigh and hip following a septic wound, and from which he died.

The capsular ligament was found to be intact and showed no mark of injury whatever, but the ligamentum teres was lacerated through one-quarter of its thickness, and there were spots of ecchymosis about the laceration which showed that the ligament had been put upon a stretch and was torn before death. Both this and the capsular ligament were of normal thickness and strength.

D. Morrant Baker (*St. Bartholomew's Hospital Reports,* 1874, vol. x. p. 287) describes the case of a child one year of age, who was put astride of a horse, and when taken off played about for two hours without making any complaint. At the end of this time he had pain in the left hip and began to limp, and some weeks afterward it was found he had a dislocation of the hip. At the end of six weeks the other hip was also dislocated, but it had been perfectly normal at the time the first dislocation was discovered.

Dr. White (*Buffalo Medical and Surgical Journal,* 1861–2, vol. i. p. 50) describes the case of a woman twenty-eight years of age, whose hip was spontaneously dislocated while she was lying in bed, from effusion into the joint, but when there were no conditions of fever present.

Dr. Ashmead (*Transactions College of Physicians,* Philadelphia, 1846, vol. i. p. 265) relates the case of a girl eight years of age, who fell upon both knees, but jumped up and ran home. Some inflammation of the knee-joints followed, but she kept about. Nearly one month after the injury to the knees she was noticed to walk awkwardly in going up stairs, that one hip projected more than the other, and that one leg was longer than the other, but at no time was she in bed or prevented from going about. There was a spontaneous dislocation of the hip, which eight months from the time of the original injury was reduced, and she made a perfect recovery.

W. H. Barthelot (*New Orleans Medical News and Hospital Gazette*, 1855, vol. ii. p. 415) reports the case of a spontaneous dislocation of the hip-joint in a boy eight years of age, whose mother thought he had received a blow. His lameness progressed until it was found that he had a dislocation of the hip upon the dorsum of the ilium. It was reduced and the boy got perfectly well.

Mr. Barwell (*British Medical Journal*, May 2, 1896, p. 1090) reports the case of a naval officer who was greatly troubled with boils, and which culminated in an attack of erysipelas followed by several abscesses of the face and accompanied by high temperature. One night he was attacked with severe pain in his right hip, and when he left his bed he was very lame, and after some little time the hip was found to be dislocated. This was reduced, and in three days he walked as well as ever, and in four months returned to his duties on board ship.

The pathology of these cases of spontaneous dislocations is, of course, similar to that occurring in the course of typhoid fever, acute rheumatism, and septic cases, in that the capsular ligament is overdistended with fluid, and, as the experiments by injecting the capsule show, this readily admits of the head of the bone slipping out of the socket, and the muscles draw it up upon the dorsum of the ilium.

Lente, in remarking upon the causes, contends that relaxation of the ligamentum teres cannot occur, owing to the character of the tissues, but that it can, by persistent pressure, and in a softened state, become elongated.

The records of many of the reported cases show that reduction of the dislocation was accomplished with comparative ease, and the after-results most satisfactory as to freedom from recurrence and usefulness of the limb, provided that too long a time has not elapsed since the displacement.

In my own case, of course, any attempt at reduction of the dislocation was not to be considered, as it had occurred nearly fifteen years before he came under my observation.

DISCUSSION.

Dr. Reginald H. Sayre said that he was reminded of a case that he had shown to the Society of the Alumni of Bellevue Hospital some years ago. This girl had congenital dislocation of the urethra, and, with her legs in a parallel position, was unable to hold her urine. In consequence she had drawn one leg across the other to prevent wetting herself continuously. The mother had not seen the child for several years, but said that the last time she had seen her the girl had run around without trouble. She was very lame at the time she came under his observation. The head of the femur was high up on the dorsum of the ilium, and the history of the case showed that this had occurred gradually, the leg being strongly adducted. The adductor tendons and psoas muscles were divided by open incision, but the bone had created such a good socket for itself on the dorsum of the ilium that it was thought best to simply place the limbs parallel to each other. The limbs stayed parallel for some time, but gradually returned to an abnormal position, apparently from the patient's efforts to prevent incontinence of urine. Another surgeon endeavored by a plastic operation to relieve the incontinence of urine, but without much success. The child was in excellent condition, and there seemed to be no tubercular taint.

Dr. Goldthwait, of Boston, said that he desired to report a somewhat similar case to that described in the paper—that of a woman, about thirty years of age, who had what was called rheumatism. The affection was monoarticular. She had been treated as a medical patient at the City Hospital for a time, and then was under the care of the surgeon. At that time the thigh was flexed and inverted, evidently due to a dislocation of the head of the femur. An operation was performed and an unsuccessful attempt to correct the position was made. The position of the femur was demonstrated by opening the capsule. Some months later she came to the Carney Hospital. Under ether the leg was manipulated, and, to his surprise, the head of the bone was replaced in the socket. The patient is now well and is able to walk freely on that leg. There is no shortening, and there was about half the normal amount of motion.

Dr. Ridlon reported a case seen by him some years ago. It had been referred to him as hip-disease, and had been under treatment in bed for a year by weight and pulley. On examination he had found the head of the femur lying underneath the anterior superior spine of the ilium. On exploratory incision by another surgeon the diagnosis was confirmed, but the dislocation was not reduced. Subsequently the head of the femur had been excised. The dislocation had occurred while the boy was in a gymnasium. He was able to walk home, and some days afterward the diagnosis of hip-disease had been made.

Dr. McKenzie, of Toronto, said that from listening to the history of the case described in the paper it was fair to assume that the dislocation occurred at the time of the injury. The fact that the child played about, in view of the fact that a splint had been put on, was not sufficient proof that dislocation did not occur at this time. The same remark would apply to the case reported by Dr. Ridlon. A few months ago he had been called in to see a patient whom he had visited some years before after he had a fall at a time when he was wearing a right Thomas hip-splint. At that time he had not recognized the dislocation of the left hip, but it was now very evident, and he did not doubt that the left hip had been dislocated when he fell. He had previously reported to the Association a case of spontaneous dislocation in a woman who had been ill with some symptoms of rheumatism (Trans. American Orthopedic Association, vol. v. p. 35). While undressing the woman became hysterical and required medical treatment. She remained sitting in bed much of the time for several weeks, frequently pressing her folded hands upon her flexed knee as she sat up. When he saw her, about two months later, there was a distinct dislocation of the hip backward and forward. It was easily and permanently reduced, but there was complete anchylosis. This condition still existed when he again examined her about two years later.

Dr. Taylor, in closing, said that there was no lameness or limp of any sort until six months after the injury, so that it was almost certain that the dislocation did not occur at the time of the accident.

ABSCESS IN HIGH DORSAL CARIES.

By E. H. BRADFORD, M.D.,
BOSTON.

The draining of abscesses in caries of the spine under proper treatment is not always urgently indicated. In many instances these abscesses are absorbed. Under certain conditions, however, the immediate drainage of the abscess is necessary. When an abscess is in the high dorsal region and is situated in front of the spinal column, incision of the abscess is attended with certain difficulties, both as to the localization of the abscess and as to the lines of incision.

The following case will serve as an illustration: A child of five years of age had been suffering from caries of the spine for two years, and entered the hospital with paralysis of the lower extremities. She was treated by recumbent fixation and head-traction, and improved so that motion returned to the legs. She was furnished with a spinal support with head attachment, and allowed to sit up, but attempts to raise the child even with an appliance which supported the weight of the head was followed by attacks of dyspnœa and cyanosis, which disappeared as the child was replaced in a recumbent position. The course of treatment by recumbency was continued, but on any attempt to move the child dyspnœa followed. Subsequently attacks of dyspnœa occurred even when the child was recumbent. The frequency of these increased, and the child finally died apparently from suffocation. An abscess was found pressing upon the trachea and occluding a portion of its cavity. This abscess was situated in front of the spinal column, but extended to each side, especially on the right. The cord itself was normal, although the disease of the bodies had extended so as to develop a local meningitis. The relation of the abscess to the recurrent laryn-

geal nerve was not determined. The abscess was so placed on the right side that it could be incised in its most dependant portion, if an incision had been made from the back. If this had been done, death could in all probability have been prevented, and the chances of recovery usually following careful treatment of Pott's disease given to the patient.

Costo-transversectomy is an operation which has been recommended for cases of this sort and performed first by Shafer, of Chicago, and recently successful in a number of cases by Menard. The method of treatment consists of a resection of the transverse process of one of the vertebræ and a portion of the adjacent rib. At first the operation would seem a dangerous one; on examination it will be found, if properly carried out, that it is feasible and without great risk. Anyone who has had experience with resection of portions of the rib with children, for drainage in empyema, can testify to the ease with which this can be done without opening the pleura, until a sufficient portion of the bone has been removed to allow a free opening for the escape of the contents of the abscess.

The same method with slight modification is applicable in costo-transversectomy. Experiments upon the cadaver of infants will demonstrate the feasibility of this procedure, and in the case of young children it is not necessary to resect a portion of the transverse process; a removal of the portion of the rib being sufficient to admit the exploring finger, which is sufficiently long to reach to the anterior surface of the spinal column in children. If a cross-section of the trunk at the level of the upper dorsal region be examined, it will be seen that if the exploring finger is passed so as to keep close to the bone, the danger of injuring the large vessels can be avoided with ordinary care. In case of the formation of an abscess, the pleural walls are not only thickened, but pushed away from the bones, thus facilitating the introduction of the finger between the pleura and the bones, and the avoidance of the vessels and nerves.

The operation consists of a straight incision slightly to the outer side of the spinous processes, directly down upon the transverse processes at the junction of the ribs, or a little at the outside. The tissues are drawn aside by hooks; the periosteum is separated from the head of the ribs and the tip of the transverse process and the end of the rib removed by means of bone forceps. For protection a strip of metal can be passed under the rib between that and the periosteum, which is closely attached to the pleura. A portion of one or two ribs can be removed, and the external surface of the pleura is easily seen. The finger is inserted, and by gentle manipulation the pleura can be separated from the adjacent side of the affected vertebra. The finger is passed in carefully to explore the whole of the right side of the bodies. The abscess will be found situated between the pleura and the bone. A practised touch can detect the condition of the bone and the size of the abscess.

Operations for the draining of ante-vertebral abscess, and the exploration of the spinal column in the lumbar and lower dorsal region are well known. In the mid-dorsal region they are less common. The writer can report a successful case of drainage of an abscess in the mid-dorsal region in a child of six years, where costo-transversectomy was employed. In abscesses of a higher cervical region the drainage as a rule presents but little difficulty, as they present themselves either in the mouth or at the side of the neck. In some instances they

appear in the side of the neck under the sterno-cleido-mastoid. If they are threatening, and time cannot be given for them to gravitate and point in the axilla or above the clavicle, an incision can be made; the line of incision can either be from behind or in front. There is less bleeding if the incision is made in front, and the overlying tissues are not as thick, and the anterior incision is therefore to be preferred, though it is necessarily made near the large vessels. The incision is either that for the ligature of the carotid, the vessels being pulled to the outside, when the abscess will be found between the vessels and the larynx and œsophagus, or the incision for the ligature of the vertebral arteries, which is made to the outer side of the sterno-mastoid. As a choice between these methods, the election will depend upon the size and situation of the abscess. Where the abscess is on the level of the clavicle, or in that vicinity, an incision from the back is naturally preferable. This is certainly the case in lower portions of the spinal column. Where the abscess points in the mouth an incision should be made in the median line. The method of operation is easy if an anæsthetic is given; this should be carefully done; the tongue is depressed, a gag is inserted between the jaws, and the knife is thrust, the incision being made upward, with the knife placed back downward against the tongue, the finger being used as a guide.

Some difficulty is met in recognizing the existence of the abscess in the cervical and high dorsal region, when it is situated anterior to the spinal column. The case here reported would indicate that where attacks of alarming dyspnœa occur, when the disease is in the lower cervical or high dorsal region, the presence of such an abscess may be suspected.

DISCUSSION.

Dr. R. H. Sayre said that he had had a case very similar to the one just reported by Dr. Bradford, although he had not suspected the existence of the abscess until the child had died from sudden suffocation, although it had been playing about the room a few minutes before. The autopsy showed a saddle-bag abscess just at the bifurcation of the trachea. Dr. Schaefer, of Chicago, had described

one or two of these cases, with a method of operating. In some of these cases he had passed in a probe and cut down upon it, and then introduced a drainage-tube from one side to the other. The results had been excellent in the one or two cases reported. It seemed to him that this plan was feasible.

Dr. Sherman said he had inadvertently done this operation on a patient in whom the abscess had perforated an intercostal space and produced an accumulation under the skin. On opening that, an opening was found between the ribs. A piece of the fourth rib was taken out, and thus easy access was obtained. It was possible to explore the anterior surface of the bone in this way. In Treves's operation the spinal column could be included between the two fingers, and the parts thoroughly explored. The operation was a comparatively easy one, if the way were made plain by the abscess burrowing between the ribs, but he would expect it to be a difficult one where there were no external manifestations. The greatest difficulty would be in making the diagnosis of the existence of such an abscess. It would require the exclusion of enlarged glands and other conditions. He had once drained a horseshoe abscess by passing a strand of gauze around the spinal column through openings in either loin.

Dr. C. C. Foster, of Boston, said he was reminded of a case that simulated an abdominal aneurism; all the signs of this condition being present except the aneurismal bruit.

Dr. Ketch said that some years ago he had called the attention of the Association to two cases of Pott's disease, higher up than in the case under discussion, in which there had been no possible way of making the diagnosis of abscess. One of these children, in apparent health, was suddenly seized with urgent symptoms, apparently indicating pressure against the respiratory centre. Death occurred within ten or fifteen minutes. No autopsy was permitted. The disease had been located in this case between the second and third cervical vertebræ.

Dr. Ketch asked if other members of the Association had seen

any cases of high cervical disease in which there had been sudden death.

Dr. Goldthwait recalled one, an out-patient case, terminating suddenly in death.

Dr. Weigel recalled a case of impending suffocation in which he had been able, however, to drain the abscess quickly by an external incision. As there was great cyanosis, death would probably have occurred in a short time if relief had not been given.

Dr. A. E. Hoadley said that some years ago he had had a patient suffering from a most persistent and troublesome cough, spasmodic in character, which was frequently associated with what appeared to be spasm of the glottis. The cough would not yield to any treatment. He had made a diagnosis of a growth in the posterior mediastinum, with pressure upon the recurrent laryngeal nerves. After a time, a protrusion was discovered in the neck. There was evident pressure on the recurrent laryngeal nerve. The pressure of such a growth might possibly produce death by spasm of the glottis.

Dr. A. M. Phelps, of New York, said that he had seen a case in Westminster Hospital, London, of high disease of the spine, under the care of Mr. Davis. The man died very suddenly, and the post-mortem examination showed disease in the atlas and axis.

Dr. McKenzie referred to a case in which sudden death was found to have been due to the giving-way of the ligaments and the pressure of the odontoid process upon the cord.

Dr. Bradford, in closing the discussion, said that he had reported the case, partly to call attention to the treatment by operation, and also to bring up the point alluded to by Dr. Ketch. Where there was disease of the axis and atlas there was danger of direct pressure upon the respiratory centre. Where the disease was lower down, and was associated with suffocative symptoms, it was fair to conclude that there was an abscess present. By gravity, such an

abscess might sink so as to increase the pressure between the clavicle and the spinal column. The surrounding parts act as unyielding walls; hence, the danger of pressure upon the respiratory passages or nerves. In a case of this kind he saw no objection to making an exploratory incision like that he had recommended. It was, of course, a grave procedure, but we were dealing with a probably grave emergency, and it therefore seemed to him perfectly justifiable.

A CLINICAL STUDY OF INJECTIONS OF IODOFORM-GLYCERIN IN TUBERCULOUS OSTEOMYELITIS.

By HARRY M. SHERMAN, A.M., M.D.,
SAN FRANCISCO,

AND

AGNES WALKER, M.D.,
SAN RAFAEL.

"It is natural for man to indulge in the illusions of hope," and impelled by a hope that I might find, in my own experience, something to substantiate the statements of some others regarding the value of iodoform in tuberculosis of bones and joints, I began the little series of treatments here reported. It is true that I am making a somewhat tardy report, tardy in that the majority of you have long had well-defined opinions, based on experience, in the matter. But before beginning my own systematic trials of the method, I had patiently waited for a definite statement from an American source, and in waiting I had lost time. I do not mean to say that American journals contained nothing concerning the matter; on the contrary, there was a good deal; but most of it was in a form that led me to reject it as an authoritative enunciation, and the claims of the rest, in the first place, seemed to me extravagant, and, in the second place, they induced in me a desire to know if they might possibly be true, and a hope that enough of them might be true to warrant the use of the method in certain cases.

The cases submitted to the treatment were patients in the Children's Hospital, in San Francisco. The time covered in the trial was the three years beginning January, 1893. The number of cases submitted to the treatment was 20, and these represented 15 hips, 2 knees, 2 ankles, and 1 elbow. Up to the middle of 1894, that is, for the first half of the three years, the intention

and effort always was to deposit the iodoform in the joint cavity, or the intimate periarticular tissues. After the middle of 1894 the injections have been into the diseased bone itself, intraosseous injections. It chances that there was a total of 81 intra- or periarticular injections given, and a total, likewise, of 81 intraosseous injections, and 2 injections into the evacuated cavities of the tuberculous abscesses, making the entire number of injections 164. In each case, and at each injection, note was made of the following points: 1. The location and direction of the puncture of the needle, the depth of its penetration, and the character of the tissues through which it passed, so far as this could be estimated. 2. The amount of the iodoform-glycerin injected. 3. Whether there was or was not a reflux of the iodoform-glycerin through the puncture hole after the removal of the needle. 4. Whether there was or was not pain following the injection, and the location of it. 5. Whether there was or was not a general reaction following the injection.

In all a uniform mixture of iodoform and glycerin, 10 per cent. of the former to 90 per cent. of the latter, both by weight, has been used. In the first series of treatments, the intra- and periarticular cases, no special effort was made to have the mixture sterile, but I was fortunate enough to have no pyogenic accident, all abscesses that developed being chronic and tuberculous. For the intraosseous cases I had the iodoform-glycerin always sterilized by exposure to the temperature of a boiling-water bath for two hours, and as iodoform does not volatilize below 239° F., nor glycerin boil below 554° F., I never had any decomposition of either. No bacterioscopic examinations of the product were made, but clinically the mixture was always sterile. In the intra- and periarticular cases an ordinary syringe, similar to a hypodermic syringe, and with an ordinary leather packing, was used. The syringe held half an ounce. When it came to the intraosseous cases I found it necessary to have special apparatus. I had a needle made similar to that described by Schüller. It is of very strong steel and has a canula fitting the bore closely and ground flush with the bevel of the needle-point. The syringe was made with an extra heavy cylinder of glass, to hold two ounces, and I was obliged to fit a ratchet on the piston rod, and a pinion-wire key to develop the force necessary to drive the iodoform-glycerin through the cancellous bone. In the intra- and peri-

articular cases it was not difficult to imagine the location and distribution of the mixture in the tissues, but in the intraosseous cases a little investigation was necessary. It is a very easy matter to thrust the needle through tuberculous bone, for there is absolutely no resistance from the wasted skeleton of the bone itself. If the bone be removed from the body immediately after the injection, and sawn so as to lay open the puncture track, it reminds one somewhat of the track of a bullet through wood. The osseous trabeculæ are broken, upset, and pushed aside, and the track does not collapse on withdrawal of the needle. The iodoform-glycerin, forced from the needle-point, follows the direction of least resistance, and that is backward along the sides of the needle; but there is a distribution of it through the cancelli to a varying distance on all sides of the puncture, the spongy tuberculous granulation tissue being partly carried before it. I tried to see if anything of the kind could be done in normal bone, and used a sheep's femur for the purpose. The texture of the cancellous tissue of sheep's bone seemed a little finer than that of the human bone, but the bone itself was not so hard. The needle was driven in with a mallet and without any difficulty. The injection of even the minutest portion of iodoform-glycerin was an absolute impossibility, the cancelli were so full of firm, adherent medulla that there was no room at all for any foreign substance, and the needle was held in its place as tightly as a nail in a board.

In the intra- and periarticular injections the joint was approached from different sides, but in the hip cases, which were the largest number, the usual approach was by the method suggested by von Bügner. A point was found on the inner border of the sartorius muscle and on a level with the anterior superior iliac spine. A needle passed directly backward here will pierce the capsule and impinge on the neck. I modified the plan slightly by making the puncture at the outer border of the sartorius, directing the needle backward and a little inward so that when it reached bone the point should be under the von Bügner point of entry. Moreover, the needle was so held that the bevel on the end was next the bone, thus endeavoring to have the opening in the end entirely within the capsule. If, after an injection made in this way there was no reflux, and there was pain in the knee, it was arbitrarily assumed that an

intra-articular injection had been made. In the intraosseous injections, too, the bone was punctured from different sides, but the usual route was through the trochanter and up into the neck and head, that being the most common site of the primary focus of the infection in the bone. In these injections it was generally possible to appreciate whether the needle-point was passing through soft tissues, cartilage or bone, and also the firmness of the bone. In this way a very fair estimate could be made of the extent and severity of the lesion.

Abstract of the Records of Individual Cases, by Agnes Walker, M.D.

Intra- and Periarticular Injections.

Case I.—Boy, aged eight years; hip-disease; second stage, chronic type; abscess. Limb was in good position and boy in bed with traction on. There were sixteen intra- or periarticular injections, each of ℥j of the iodoform-glycerin; in but four was there any reflux; pain always followed and was located at the hip and knee; there was usually a slight reaction, but never above 103° F., and after five injections there was no reaction. Early in the treatment an abscess developed near the anterior superior iliac spine, but was resorbed. After the resorption of the abscess he was gotten up on crutches and a traction splint. At the end of eighteen months he was in excellent general condition, and this form of injection was suspended. There had been much improvement, but no more than might have occurred under protective methods alone.

Case II.—Boy, aged four years; knee-disease, severe chronic type; no abscess. Limb was in a plaster-of-Paris splint. There were five intra-articular injections, each ℥j. After none was there reflux; there was always pain in the knee, and there was always, but once, a slight reaction. At the end of eighteen months the swelling had diminished, and there was no pain when the limb was at rest, but there was joint rigidity and tenderness, and this form of injection was suspended. Here, too, there had been improvement, but not an exceptional amount.

Case III.—Girl, aged eight years; hip-disease; second stage, mild type; no abscess. The joint permitted 97° flexion, 170° ex-

tension, and 20° abduction. There was one and a quarter inches shortening. There were six intra-articular injections, each ♏l–℥j, extending over a period of eight months. There was no reflux, always pain in hip and knee, and never any reaction. At the end of the eight months there had been a gain in extension, a loss in flexion, 46° as against 97°, and a loss in abduction, 11° as against 20°, and some gain in rotation. The child left the hospital on crutches and wearing a splint.

Case IV.—Girl, aged five and a half years; ankle-disease; severe type, but the lesion seemed to be confined to the astragalus. Motion was very limited. There were three intra-articular injections, each from ℥j–℥jss, at intervals of five or six weeks. There was always pain after them, but no definite record of reaction. There was no therapeutic result, and this form of injection was suspended.

Case V.—Girl, aged eleven years; elbow-disease; chronic type. Flexion permitted to 61°, extension to 143°, *i. e.*, about 25° of motion. Eleven intra- and periarticular injections, each from ♏xl–℥j, were given, the joint being approached from all sides. There was little or no reflux, pain was in the elbow, and reaction was always slight. At the end of these there was some less swelling, but about the same amount of tenderness; flexion 74° and extension 160°, a small gain in each. This form of injection was here suspended.

Case VI.—Boy, aged five and a half years; hip-disease; second stage, mild type; no abscess. He was kept in bed with traction on. Nine intra-articular injections were given, each about ℥j. There was little or no reflux; pain was referred to the hip, once to the knee, and there was practically no reaction. The treatment covered seven months, and shortly after the last injection he left the hospital walking on his traction splint. Two months later he was seen, was still on his splint, and in good condition. He is reported now, two years later, as being perfectly well, with a good joint and but three-quarters of an inch shortening and very slight limp. This case certainly ran rather a short course.

Case VII.—Boy, aged six years; hip-disease; second stage, severe type; no abscess. The boy was in bed and the limb was on an inclined plane with traction on. Eight intra-articular injections were given, each about ʒj. There was but twice any reflux; pain

was referred to the hip, once to the knee, and three times there was marked reaction, the temperature once reaching 104° F. During treatment an abscess developed anterior to the hip and opened spontaneously; it left sinuses which persisted, were followed up into the joint and the bone found to be diseased and soft, and so an excision was done. Healing was slow but uneventful, and the boy is now well, but does not, as yet, use the limb. Here the type of the disease was severe and the injections useless if not harmful.

Case VIII.—Boy, aged six years; hip-disease; second stage, severe type. The limb was fixed in a position of 30° flexion and complete external rotation. There was a fulness in the groin. Six intra-articular injections were given, each about ℥j. There was but once reflux; there was pain in the hip only, and reaction but twice, and then slight. The condition of the hip gradually grew worse the swelling proved to be an abscess which burrowed up into the pelvis, and excision was finally done. Healing was uneventful. The child is reported now, two years after leaving hospital, as being in excellent condition, with a limb one and a quarter inches short, but one on which he can walk without stick or crutch.

Case IX.—Boy, aged three and a half years; knee-disease. The disease was of a rather severe type, with a tuberculous abscess occupying the joint and burrowing down the front of the leg. Three intra-articular injections were made, each of ♏xlv, and each time after a washing out of the joint with boric-acid solution. The effect of the treatment was to control pain and to slightly increase motion. Shortly after the last injection tuberculous meningitis developed and ended fatally.

Case X.—Boy, aged seven years; hip disease; second stage. The type was mild, but there was some intra-articular thickening. He was kept in bed with traction on. Nine intra-articular injections were given, two of ℥ss each, the others ℥j. There was no reflux; pain was referred to hip and knee; twice he had severe reactions, and once the reaction temperature of 104° ran up to 108°, and varicella, then epidemic in the hospital, developed. At the end of the treatment he left the hospital on splint and crutches, with the joint quite firmly fixed in a position of 30° flexion. In this case there had been apparently improvement. His present condition, two years after leaving the hospital, is exceptionally good, the joint

showing, on careful examination, practically no trace of having been affected.

Intraosseous Injections.

Case I. of last series. Five injections were given, all into the femoral neck and head, each of ℥ij; there was no reflux; pain was in hip and knee, and reaction was slight. In each instance the bone had been easily penetrated by the needle, but was, at the same time, able to support the weight of the body. Two months after the last injection he left the hospital wearing no splint, with full extension and 50° flexion, and one-half inch shortening. The total amount of iodoform used on this boy was grs. cliv. Every effort to trace him and learn his present condition, a year and a half after leaving the hospital, has failed.

Case II. of last series. Thirteen injections were given into the lower femoral epiphysis. Smallest amount ℥j, largest amount ℥iij, average amount ℥ij; there was slight reflux; pain was in knee, and reaction was slight. The bone was of varying consistency, but always penetrable. Shortly after the last injection he was taken from the hospital wearing a leather knee-splint and a Thomas walking-splint. The knee was quite but not entirely rigid. The total amount of iodoform used on this boy was grs. clxxvj. It has not been possible to trace him since.

Case IV. of last series. Three injections into the astragalus were given, each of ℥j–℥jss; reflux was insignificant; pain usually severe, and reaction slight. Nothing was being gained by the treatment, tuberculous abscess formed, pointed and opened, and it was decided to remove the astragalus, as that bone seemed to be the only one involved. The operation disclosed, however, such extensive disease of the foot and the medulla of the tibia, that amputation had to be done.

Case V. of last series. Four injections into the bones at the elbow were made, each from ℥j–℥ij. There was little reflux; pain was in the elbow, and there was no reaction. The bone was always easily penetrated. During the whole of the treatment the arm had been in a plaster-of-Paris splint, and at the end there was a slight recognizable improvement, such as a gain of 13° flexion and 17° extension. The total amount of iodoform used was grs. xcij. Shortly

after the last injection the parents took her from the hospital, and it has not been possible to find her since.

Case XI.—Girl, aged eight years. Old hip-disease with discharging sinuses. Two injections were given, each of ℥ij, one into femoral neck and one into wall of acetabulum. The result was not good, and excision was done. At present, twenty months after operation, the child is dying of general tuberculosis.

Case XII.—Boy, aged nine years; hip-disease; second stage; no abscess. Three injections were given: one of ℥ij into femoral neck, finding bone very hard; one of ℥iv; and one of ℥ij into tuberculous bone in pelvis, anterior and inferior to acetabulum. There was no reflux; pain was in hip and knee, and there was no reaction. After the last injection there was an indurated and tender swelling at the point of puncture. An incision disclosed the iodoform in the track of the needle-puncture, but no pus. Much diseased bone was found, and this was removed, the operation being practically an excision. Healing has been slow, but is complete. Use of the limb has not yet begun.

Case XIII.—Boy, aged five and a half years; hip-disease; second stage; no abscess. Five injections were given, penetrating the femoral neck in various directions, four of ℥ij each and one of ℥iv. There was no reflux; pain is not recorded; reaction moderate, and once absent entirely. At the beginning there had been little or no induration or swelling of tissues around the joint. Two weeks after the last injection a tuberculous abscess developed, though there had been a slight gain in joint motion. Excision of the hip was done, and the boy died the following day. The bone removed showed no evidence of any response to the action of the iodoform.

Case XIV.—Boy, aged five years; hip-disease; second stage; no abscess; and also a vertebral tuberculosis. Nine injections were given into the femoral neck and head: six of ℥ij, one of ℥iij, and two of ℥iv. The bone was hard in some places and soft in others. There was never reflux; pain was in hip and knee, and reaction was slight or absent. His general condition rapidly deteriorated, and the local condition as well. Hip-excision was done; the head of the femur was entirely disintegrated. There was perforation of the floor of the acetabulum, and an abscess in the pelvis. The wound

has just healed a year after the operation. The amount of iodoform used in this case was grs. cxxxviij.

Case XV.—Girl, aged eight years; hip-disease, with a discharging sinus which did not connect with the joint. Sinus was laid open and curetted and wound stitched. After firm union had taken place eight injections were given into the femoral neck and trochanter, five of ʒij and two of ʒiv; the amount of the eighth injection was not noted. A slight reflux followed two of the injections; pain was felt in the hip only, and the reaction was considerable on only one occasion. Several small tuberculous abscesses developed about both hip and knee, and no benefit resulted from the injections. The abscesses were opened and curetted and the injections discontinued. The child is still wearing a splint, thirteen months after last injection. Over grs. cviij of iodoform were used in this case.

Case XVI.—Girl, aged six years; hip-disease; second stage; no abscess. Only two injections of ʒij each were given, as both general and local conditions commenced to deteriorate very rapidly and hip excision became necessary. At the time of operation the femoral head, neck, and trochanter were found to have been largely absorbed and almost detached from the shaft of the bone. The wound healed firmly and the child left the hospital on crutches. At the present time the hip is somewhat flexed, and there is a slight discharge from the site of the operation where the cicatrix has broken down.

Case XVII.—Boy, aged five years; hip-disease; third stage; abscess. Thirteen injections were given, eleven into the femoral neck, the bone being quite soft, and two into the cavity of an abscess which formed about the joint and was evacuated twice. As this abscess was thought to be aggravated by the injections, they were discontinued and the boy remained in bed for six months, then left the hospital on splint and crutches, which he is still wearing at the present time. Over grs. cl of iodoform were used in this case.

Case XVIII.—Boy, aged four years; tarsal disease; small sinus. Two injections of ʒij were given, and were followed by severe pain and some reaction. The injections were made into the centre of the tarsus; they appeared to have little or no effect on the course of the disease, and the foot finally healed after a year's rest in a plaster splint.

Case XIX.—Boy, aged six years; hip-disease; third stage; abscess. First injection was made through an aspirator into the cavity of an evacuated abscess. The second injection was a double one, ℥$\frac{2}{3}$ being injected into the abscess cavity and ℥ij into the neck of the femur. In all sixteen injections were given, of which fourteen were made into the neck or trochanter of the femur. The usual amount injected was ℥ij, but on two occasions ℥iv were given. A slight reflux occurred once; pain was always felt in the hip and was thrice complained of in the knee. The temperature only once rose to about 102°, and usually was under 100°. The boy improved slowly in general health, the abscess in the hip ceased to refill, and he eventually left the hospital on a splint and crutches, the hip being quite firmly anchylosed.

Case XX.—Girl, aged seven years; hip-disease; second stage; no abscess. Only three injections were given in this case. They were made into the trochanter and neck of the femur, and were each ℥ij. Slight reflux of injected material and synovial fluid followed one. No pain and little reaction resulted.

The following points may be recorded:

The greatest number of injections given any one case was twenty-one.

The greatest amount of iodoform given any one case was grs. cxcviij.

The greatest amount of iodoform given at one injection was grs. xxiv.

The highest temperature of reaction following an injection was 104° F. Usually the height of a reaction was attained in a few hours, but in some cases not for two days.

The usual interval between the injections was two weeks, but sometimes they would be suspended for two, three, or four months, to permit observation, and then be resumed.

In no case was there any iodoform-poisoning. In no case was there any suppuration sequent to the injections.

During the treatment 7 cases improved as if under protective treatment alone; 10 cases got worse, 5 having tuberculous abscesses develop, and 7 being submitted to operation, 1 of whom died; 3 cases were unchanged; 1 died of tuberculous meningitis.

I asked Dr. Walker to abstract these cases in these two series, because the mode of operation of the drugs must be different in each. In the periarticular method the drugs are deposited in or close to the advancing line of infection, where bacillary life is most active, and where the iodoform could exercise its supposed germicidal effects, and also by its irritative action, aided in this latter by the more irritant property of the glycerin, stimulate the growth of the protective wall of fibrous tissue. But the absolute impossibility of knowing just where the limits of the infected tissue were, and the great probability that the iodoform-glycerin was often deposited in sound tissues, where it was simply a foreign body, led me to abandon this plan. Intra-articular injections, reaching a point within the infected areas, gave a little more promise, theoretically, for the efficient action of the iodoform, but, again, it could affect only the particular articular structures—the synovial membrane, for instance —and left untouched the original foci in the bones, except in those cases where there had been ulceration of the articular cartilages, opening the cancelli of the bone to the joint cavity.

In most of my excision cases I have found a diffuse tuberculosis of head, neck, and greater trochanter, and the softened bone that the needle of my syringe always discovered showed that this condition existed in these cases. It seemed an improvement, then, to adopt the intraosseous method. The idea of flooding the cancelli with iodoform-glycerin is not quite practicable. Bone tissue, even if infected with tuberculosis, is not elastic, and but so much iodoform-glycerin may be injected, as blood or other fluids may be driven out. If the injection is made into a tuberculous focus very early in its history, I cannot help feeling that, under the forced flow of the iodoform-glycerin, some of the tuberculous tissue, or products, or the bacilli themselves, may be carried outside the original limits of the focus into the surrounding healthy areas, and in view of the very feeble germicidal action of the drug, this would tend to the extension of the lesion. In cases where the lesion is a diffuse tuberculosis this danger is not so great, and, as most cases that come to us have much more than a focus alone, the risk may be considered to be principally theoretical.

Once the iodoform-glycerin is in the infected area the question of its mode of action there arises. The inability of tissue infected

with tuberculosis to itself inaugurate, or be stimulated to, any reparative action limits the drugs to germicidal effects only; but if these could be accomplished, there should be left something that could, in a little time, be easily disintegrated, absorbed, and replaced with sound cicatrix. I did not see any such happy results in my cases. In general, it seemed that the course of the disease was practically unchanged by the treatment, except in two cases where the patients were made plainly worse. Of these cases that came to excision, examination of the specimens did not show them to be in any way different from the specimens of cases that had had no injections, and almost always the iodoform itself had entirely disappeared, unless the operation followed closely on the injection. In those cases where operation was not necessary, the course of the disease, both as regards tissue changes and the time treatment was necessary, and the final results, did not vary markedly from cases treated by classical protective methods alone.

As regards the value of iodoform in the dressing of tuberculous wounds, I am a little in doubt. I have long used iodoform dissolved in ether as an application to such wounds in the dressings during healing, and have packed them with iodoform-gauze. At one time I dropped the use of it entirely, and then came back to it, under the impression that my cases had not been doing quite so well as before; but it is not uncommon to have tuberculosis take repossession of a wound in spite of all the iodoform one can get into it. The drug has, of course, an exceedingly limited range of application outside of the treatment of tuberculosis, and even here I believe it is of comparatively little therapeutic value. Each of the cases here reported, with perhaps two exceptions, had the potentiality of recovery if the drug could act as a definite germicide, and yet, as you have seen, the result was in most instances disappointing.

The search for an agent that will destroy the bacillus of tuberculosis in the tissues must go on, and probably it will some day succeed; but the past and the present can record only a series of failures, failures that are meritorious so far as the efforts they terminated were well planned and well and persistently executed, but we who live in the time of trial and failure cannot help feeling that while we must always hope and always try, still "hope deferred maketh the heart sick."

DISCUSSION.

Dr. Ridlon asked if, in any of the cases except those of hip-joint disease, any immobilization of the joints was attempted during the time the injections were being carried out.

Dr. Sherman replied that in no case was the orthopedic treatment interrupted.

Dr. Roswell Park, of Buffalo, said that he had employed intra-articular injections for a number of years, but had not seen much improvement from them. In two cases in which excision had been necessitated later on he had found the iodoform packed into a mass which had acted as a foreign body. Since then he had not used the method. He did not think it compared with the zinc chloride injections, or with the Beers method of treatment by congestion. The germicidal action of iodoform he believed to be very trifling and quite unreliable. He had found that the ordinary pyogenic cocci would grow luxuriantly on jelly containing iodoform. The surroundings in practice were nearly enough like those found in these culture experiments to make such an investigation of some practical value. He could not understand how some surgeons could speak so enthusiastically of the treatment by iodoform injections.

Dr. J. E. Moore said that the reader of the paper and the last speaker had expressed his own conclusions, derived from clinical investigation. He had been disappointed with the method in every case, except in the treatment of psoas abscess. In the latter class of cases he had gotten better results from injecting the abscess cavity with iodoform emulsion.

Dr. H. L. Taylor said that the paper had been very carefully prepared, and the results agreed with what he would expect from theoretical considerations. In giving up any idea of benefit in these cases, we should not forget that in discharging sinuses a solution of iodoform in ether was sometimes very valuable. When the tuberculous tissue had broken down and there was a discharging sinus on

the surface, and if iodoform were finely deposited upon the tissues, the results were often good. Where a drying effect was desired, it could be well secured by a solution of iodoform in ether. The bacilli might be killed by being dried out as well as by being poisoned.

Dr. Roswell Park said he believed that the alleged germicidal action of iodoform was due to the liberation of free iodine. Two or three times he had used a mixture of iodine and glycerin, believing that iodine and other haloids were most excellent bactericidal agents.

Dr. Moore asked how the glycerin would add to the virtues of the iodine. He had used iodine and water as an irrigating fluid in tuberculous cases, and had been satisfied with the result.

Dr. Park said that he did not mean for irrigation purposes, but for the purposes of injections.

Dr. Ketch said that in studying the effect of these injections we should take into consideration whether or not mechanical treatment was also employed. It was well known that the German surgeons were in the habit of treating many of these cases by iodoform injections without protective apparatus.

Dr. Ridlon said that iodoform injections were quite generally used by general surgeons in Chicago. Dr. Senn was a most enthusiastic advocate of this method, and in no instance did he use any immobilizing apparatus in connection with this treatment. If a case of joint disease were immobilized during the time that the iodoform injections were used it would be impossible to tell, if improvement should occur, whether it was due to the protective treatment or to the injections. He now had under treatment three cases. One was a case of hip-disease which had been treated by another surgeon for nine months by iodoform injections, with no benefit, and with severe reaction after each injection. According to the statements of the family, the child steadily grew worse during the treatment. Another case—one of incipient disease in a child of five years—had been treated by another surgeon with iodoform injections in the region of the hip-joint, without immobilizing apparatus, for four months. The

third case was that of a form of tuberculosis of the knee—formerly called hydrops articuli. It had been treated for several months by another surgeon with intra-articular injections, most of the time without immobilizing apparatus. The case had steadily grown worse under this treatment. Under immobilization for a period of ten weeks, the distention of the joint had been reduced fully one-half. For these reasons we should draw well-defined distinctions between those cases treated with immobilizing apparatus and those treated without. He had treated about thirty cases by iodoform injections, but had had no experience with the interosseous injections. About one-third of these cases had done satisfactorily, and had made, perhaps, a little more rapid progress than if the injections had not been used. About one-third had kept about the same, and the remaining one-third had seemed to grow worse under the treatment.

Dr. A. M. Phelps said that when this treatment by injection was new he had tried it, but with no results. Of course protective apparatus had also been used. He was in favor of using iodoform and glycerin in tubercular abscesses after thoroughly draining them. He thought the only portion of iodoform that did good was that which was dissolved, and which was decomposed so as to set free the iodine. He believed the glycerin was useful by its hygroscopic action, for it caused a washing out of the cavity. He was decidedly opposed to injection of a joint with iodoform and glycerin until that joint had been opened and washed out, and he based this statement on the experience already referred to.

Dr. Goldthwait said that about four years ago a report had appeared upon results of injections with cinnamic acid or cinnamate of soda. He had tried the cinnamate of soda in quite a number of cases with absolutely negative results.

Dr. Whitman said that the general surgeon reported these wonderful immediate results of this or that remedy, because his standard was often entirely different from that recognized by the orthopedic surgeon. The general surgeon thought chiefly of pain and the direct evidence of local disease, and cared but little comparatively for the deformity. The other had this final functional result in mind, which

persisted, and often neglected, it might be, local treatment of this character. In this country protection of a diseased joint assumed the first place, and the other methods were used in conjunction with it. He had thought the use of iodoform might be of service in the treatment of pelvic abscesses.

Dr. Sherman, in closing the discussion, said that at the time the iodoform injections were being carried out another set of children were being given internally increasing doses of creosote. One of the children took more than a drachm of creosote a day for some time, but this treatment did no good. Last summer he had inquired of Broca, of the Hôpital Trousseau in Paris, regarding the use of zinc chloride injections, and had found that even Lannelongue, the father of this method, rarely employed it now. He had also tried the method of packing sinuses with sulphur, but with entirely negative results. He expected to begin a series of experiments in dressing tuberculous wounds with ether alone, for he felt that it was quite probable that the improvement in some of these cases might be due to the ether, and not to the iodoform. He had never dared to treat tuberculous joint cases without apparatus; hence the only way one could determine whether or not the special method of treatment was responsible for the improvement was by obtaining marked improvement in a large proportion of the cases treated by this method. Glycerin was certainly useful, because of its hygroscopic as well as its sclerogenic action.

OBSERVATIONS ON THE LOCAL USE OF HYDROCHLORIC ACID IN BONE NECROSIS OF TUBERCULOUS ORIGIN,

With a Report of Cases.

By JEROME HILTON WATERMAN, M.D.,
BUFFALO, N. Y.

Having been invited to report my observations on the local use of hydrochloric acid in bone necrosis of tuberculous origin, I will present the results of a series of cases which I have recently treated by this method at the Hospital for the Ruptured and Crippled, New York.

There were in the hospital at this time several cases of necrosed bone of tuberculous origin which failed to respond to the usual methods of treatment. In some of these the most radical operative means had been employed, the bone being thoroughly curetted and all the necrosed tissue supposed to have been removed. Sinuses subsequently formed, and an examination under an anæsthetic revealed the fact that necrotic bone was still present. In the other cases of the series, irrigation with solutions of bichloride of mercury, hydrogen peroxide, packing with various kinds of gauze, and the injection of creosote and protonuclein into the sinuses had been painstakingly employed for many months without favorable results, either in decreasing the amount of discharge or in allaying the progressive character of the pathological condition. Confronted with these unsatisfactory results, I resolved to try the application of hydrochloric acid. We find by experiment that the action of the acid on healthy bone is limited to the decomposition of the mineral constituents, consisting principally of phosphates and carbonates of calcium, together with small quantities of alkaline salts, so far as we know, not affecting the animal

matter. Since in necrosed bone we have only these mineral salts remaining, the chemical action of the acid is more particularly confined to the diseased part, dissolving it without exerting any destructive influence on the underlying tissue. In this fact lies one of the real merits of the treatment, for the diseased tissue being removed, the process of reparation can go on unobstructed.

Now as to the method of employment: The acid was used in the concentrated form, whereas heretofore, for the most part, dilute solutions and solutions in combination with various substances have been used by other writers. The number of minims injected into each individual case depended, of course, on the amount of bone which was diseased and on the general condition of the patient. It is preferable not to use the acid more than twice a week, owing to the reaction and pain which might result. However, contrary to expectation, but little pain was experienced, and this I attribute in part to the fact that the patients were accustomed to more or less manipulation, having been dressed daily for several months, and also to the anæsthetic effect of the acid. In case it should produce undue discomfort, it is advisable to spray the tissues with a four per cent. solution of cocaine or cocaine and morphine a few minutes before injecting the acid; or I would suggest, as an admirable substitute, the chloride of ethyl spray. It was my custom to thoroughly wash out the sinus with sterilized water in order to remove any pus or detritus, and thus permit the acid to penetrate all of the diseased bony tissue.

The ordinary sterilized glass pipette was found to be the most practical means for the application of the acid. The tube was introduced to the bottom of the sinus and the contents deposited directly upon the necrosed structure. After this I usually allowed a minute to elapse and then irrigated the sinus with a saturated solution of bicarbonate of soda, and then applied a wet myrrh dressing. My object in using the latter in preference to dry dressings was because of the marked fetor noticed in many instances after the first two or three injections. This is accounted for by the destruction of soft tissues, and was more pronounced when the patient moved and the application was not made directly to the bone, but dropped partly on the surrounding tissues.

In certain cases of the series it was necessary to enlarge the opening during the course of treatment, particularly when the granula-

tions were so exuberant as to protrude into the lumen of the sinus, but in the majority of instances they could be removed by the introduction of a probe.

Having described in a general way the method of application, it will be of interest to relate the existing conditions at the time the treatment was begun, as well as the final results attained.

Case I.—V. B., aged ten years. Diagnosis: left hip-disease, third stage. The patient was admitted into the hospital in July, 1894. In August a large abscess on the antero-external part of the thigh opened spontaneously. Since that time the discharge has been profuse. In January, 1896, an examination showed the presence of a small amount of necrosed bone, and hydrochloric acid applications were begun. There were two minims injected twice a week for the first five weeks, and no improvement noticed; so I decided to increase the amount to six minims a week for the next three months, after which it was discontinued on account of the patient's general weakened condition. An examination last week, four and one-half months after the inception of the treatment, showed that the sinus had so completely closed as to render it impossible to insert a probe into the opening.

Case II.—M. S., aged thirteen years. Diagnosis: left hip-disease, third stage. This child was admitted December 18, 1894. In August, 1895, a deep femoral abscess was detected and an excision of the hip was performed. Suppuration followed, and daily irrigation with various antiseptics producing no effect the acid treatment was begun. The patient presented at this time an opening on the anterior aspect of the thigh and another leading to the ilium. Both sinuses were injected with four minims of the acid twice a week, receiving in all ten applications. During the course of the treatment the dressings were so fœtid that it was necessary to keep the patient apart from the others in the ward, but I do not attribute this to the acid alone, as the same condition existed to some extent prior to the treatment. The discharge was much less after the first six weeks, but at the present time the sinuses have shown no tendency to close.

Case III.—W. B., aged eight years. Diagnosis: right hip-disease, third stage. The child was admitted into the hospital in

May, 1893. There being some fluctuation about the hip-joint, the patient was aspirated, and later an incision was made in order to establish better drainage. In January, 1895, there were four sinuses around the joint, all discharging copiously. Since all efforts to heal them proved futile, in January, 1896, the patient began having injections of the acid. As the sinuses were thought to communicate, only the one on the anterior part of the thigh was injected, three minims twice a week being applied. The discharge decreased and the sinuses gradually became smaller, but the general condition of the patient in this case was so poor that treatment had to be discontinued. Three weeks ago the child was removed from the hospital, and has since died of phthisis.

Case IV.—A. V., aged five years. Diagnosis: tuberculous osteitis of the right knee. This child was admitted into the hospital November, 13, 1895. The patient had a sinus over the anterior surface of the head of the tibia, which has been dressed daily for five months. In January, 1896, the applications of the acid were commenced and continued twice a week for ten weeks. One month after its discontinuance the sinus was nearly closed.

Case V.—W. C., aged four and a half years. Diagnosis: right hip-disease, third stage. The patient entered the hospital in March, 1895. In October the bone was curetted under ether. After two weeks the sinus again opened into the wound. Three months later, when I began injecting the acid, there was on the upper posterior aspect of the thigh a large sinus leading to the bone. Two minims were introduced twice a week for four months. As there was no improvement I abandoned the treatment.

Case VI.—A. K., aged twelve years. Diagnosis: left hip-disease, third stage. This case was admitted in January, 1895. The child had an abscess opened in another hospital before entering here. An examination showed a deep sinus on the external part of the thigh and another posteriorly. The former was treated with hydrochloric acid and the latter packed with iodoform gauze at each dressing. The sinus thus treated with the acid has entirely healed, while the other still discharges profusely.

Case VII.—W. M., aged nine years. Diagnosis: spinal-disease involving the lower dorsal vertebræ. The case was admitted in October, 1894. An abscess over the twelfth dorsal vertebra was

aspirated and four ounces of pus withdrawn. An incision was afterward made to establish drainage. After being dressed four times a week for eight months and no noticeable improvement resulting, I commenced using hydrochloric acid, injecting three minims twice a week for four months. At the present time the sinus is not entirely healed, but the discharge is very much diminished. The patient will remain under the same treatment for another month, as this is an unusually large sinus with more necrosis present than in the other cases of the series.

Case VIII.—M. P., aged five years. Diagnosis: left hip-disease, third stage. The child was received in February, 1895, when an excision of the hip was performed. The patient was discharged in June, but readmitted in August, having marked infiltration about the joint and discharging sinuses on both the anterior and posterior aspect of the femur. In September the sinuses were curetted under an anæsthetic. A few weeks afterward, however, they again began to discharge, and daily irrigations of bichloride of mercury (1 to 5000) were used. This treatment was continued for three and a half months, after which the acid was applied. Four minims were introduced into each sinus twice a week for four months and a half, and at the present writing both of them are closed.

In these eight cases I can record four apparent cures. In numbers two and five I would suggest the possibility that either the necrosed area was larger than the probe indicated, so that not sufficient acid has as yet been applied to effect its solution, or that another area of necrosis exists at some distant point not determined by the probe. Should these conditions be present, operative methods are necessary.

The conclusions which may be drawn from the above cases are as follows:

1. No evil effects have resulted from its use.
2. The use of the acid in its concentrated form is preferable.
3. When the area of necrosis is extensive operative methods are advised.
4. Its action is limited to the necrosed area, whereas curetting may remove both diseased and healthy bone.
5. By the disintegration of the dead bone the newly-formed tissue has a better opportunity for its more rapid development.

I feel warranted in stating that the further use of hydrochloric acid as a local application in the treatment of bone necrosis of tuberculous origin is not only justifiable, but deserving of the attention of the medical profession.

I am greatly indebted to Dr. Virgil P. Gibney, Surgeon-in-chief of the Hospital for the Ruptured and Crippled, for the many and valuable suggestions given for carrying out these observations.

DISCUSSION.

Dr. W. R. Townsend said that the treatment of sinuses was an important one, and in the cases that he had seen treated by this method there had been decided improvement noted in some of them. It was probable that the best results would be obtained in the more superficial sinuses. The acid treatment had been recommended highly by others, and appeared to be a method worthy of further trial.

Dr. Hoadley said that the use of hydrochloric acid in dissolving necrosed bone had been advocated by Dr. Andrews, of Chicago, many years ago. He used weak acid, so that it was not destructive to the soft tissues. It was used as an irrigating fluid, and acted by removing superficial layers of bone in the necrosed area. Within a few hours after the application of a five per cent. solution of hydrochloric acid the bone could be decalcified without destroying other tissue, as is the case with the strong acid.

Dr. Shands asked if the treatment was very painful.

Dr. Waterman replied that the treatment had not been found to be painful in the cases he had treated.

Dr. Sherman said he could not quite understand the good to be accomplished from the use of the hydrochloric acid. The bone attacked was, of course, necrotic, but it was not the part that was chiefly diseased—the real tissue to be attacked was the granulation

tissue in the bone. It was certainly much easier and quicker to remove the necrotic bone with a sharp spoon, and at the same time remove some of this tuberculous granulation tissue. To be sure, there might not be so much danger of infection from the acid applications as from the operation.

Dr. Waterman said that in some of the cases in which the hydrochloric acid had been used the treatment had extended over very many months before a cure had been effected. He did not think the acid was of much service where there was much necrosed bone. He would advise the use of a local anæsthetic in conjunction with the acid applications.

THE USE OF DRY HEAT OF HIGH TEMPERATURE IN THE TREATMENT OF CHRONIC JOINT AFFECTIONS.

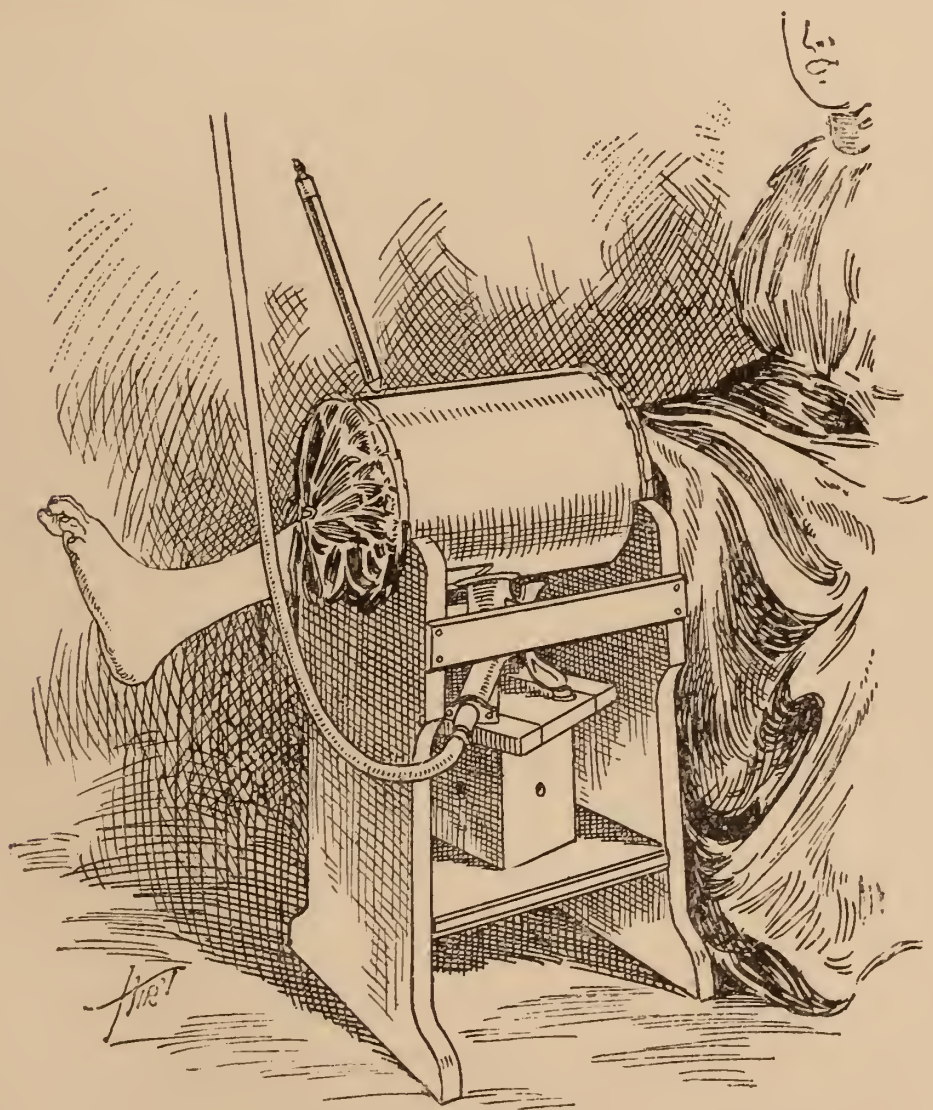
By WILLIAM E. WIRT, M.D.,
CLEVELAND.

Last October I presented to the Mississippi Valley Medical Association an informal report of the use of dry heat of high temperature in the treatment of chronic joint affections. Notice was given of this informal report in several of the medical journals throughout the United States. As a result I received during the past year a number of letters asking me to direct the writer to a full report of my method of using the heat. These letters I answered in person, but as no full report had been made it required in each case that a complete description be made of my apparatus. That my article had attracted some little attention seemed to me reason enough for my presenting at this time a full description of the apparatus I am using.

Medical writings indicate that heat and cold have been used for many ages to allay inflammations. The effect of these agents is determined by their influence in modifying the circulation and the secretions, and in certain instances by the apparent influence on the nerve-supply to a part. Heat has been used of nearly every range of temperature from that of the blood to that of the white heat of the Paquelin cautery. The low temperatures are applied for prolonged periods, while the higher temperatures are used only momentarily. The method I am describing contemplates the prolonged use of a high temperature—say 250° to 300° F.—for a period of one-half hour to one and one-half hours. While the prolonged use of low temperatures and the momentary use of very high temperatures each modify the circulation, and the latter probably the nerve-sup-

ply, they neither of them markedly influence the secretions. On the other hand, the prolonged use of high temperatures enormously increase the secretions, while also influencing the blood- and nerve-supply.

Physics and physiology teach us that while the body can only bear a temperature of about 160° in a saturated atmosphere, yet, if the air is kept very dry, the body can endure a temperature of several hundred degrees F. for part or even a whole hour. To give exact data, it is stated that a man has endured for half an hour a temperature of over 600° F. in a drying-oven.



[The foot should have been placed on a chair of the proper height.]

The apparatus before you consists of a copper cylinder twelve inches long and nine inches in diameter. Fitting into each end of the cylinder is a wooden ring or disk, one inch wide by one inch

thick. The wooden rings are secured in the ends of the cylinder by eight short screws passing from the outside through the cylinder into the rings. At each end of the cylinder is a hood which encircles the limb, and is drawn tight by means of puckering strings. The hood is made of double-coated rubber cloth, and is attached to the cylinder by being nailed to the wooden rings, the extreme end of the hood being held in place by a wire band. On each side of the cylinder, diametrically opposed, are two (or three) holes three-eighths of an inch in diameter. The purpose of these holes is to allow a rapid change of air in the cylinder. In use I have felt the air come out of these holes with such force as to put out a lighted match. The cylinder is supported horizontally in a wooden frame, so that the lower surface of the cylinder is eighteen inches from the floor, or about the height of an average chair.

I have applied heat by means of oil lamps, gasoline lamps, alcohol lamps, the gas-jet, and the mixed gas and air jet, which is the Bunsen burner; the latter is probably the most convenient. The heat should not be turned on too rapidly at first, as the patient's endurance is greater if the heat is applied gradually. In using this method for the knee I apply a layer of cotton to the back of the limb in the popliteal region, securing it in place by loosely tied tapes. This is done for two reasons: in the first place, it will equalize the temperature, as undoubtedly the lower part of the cylinder is much hotter than the upper; and, secondly, I found that the profuse perspiration, resulting from the high temperature, caused a dropping of fluid to the bottom of the cylinder, where it was instantly turned into steam, and this steam would immediately scald the limb. The limb being thus protected by the cotton is inserted into the cylinder until the knee is in the centre, the heel placed on a chair high enough to keep the calf from touching, if possible, even the wooden rings, which, though they do not burn, yet they may get uncomfortably warm. The hoods are drawn tightly around the limb, and at the start rubber corks are inserted in the holes in the cylinder, but are withdrawn when the cylinder is thoroughly heated. The heat is then applied to the cylinder and is carried up to the limit of endurance of the patient, which varies from 250° to 300°, and is kept at this point for an hour or more. One patient of mine could stand a temperature of 290° for over an hour. The effect of such a high tempera-

ture is to enormously increase the perspiration from the local part, to increase perspiration over the whole body, to increase the amount of blood to the part or at least the surface-circulation, to relieve pain, and to increase mobility in the joint. The relief of pain and the increased mobility last for some hours after the application of the heat. I have used this apparatus in cases of simple rheumatism, rheumatoid arthritis, gonorrhœal rheumatism, and simple synovitis following a dislocated patella which had become somewhat chronic.

We all realize how difficult it is to give relief in such conditions as rheumatoid arthritis and gonorrhœal rheumatism. Yet I have had patients suffering from these conditions claim that the pain was relieved as soon as a considerable heat was attained, and that the mobility and pain were both benefited for some hours. Anything that will give relief to these patients will be hailed with delight by the profession at large, and especially by those suffering from these affections.

DISCUSSION.

Dr. Ridlon asked how this differed from the English apparatus used by Mr. Hasham in the treatment of flat-foot, described in the last volume of the Transactions. He had been unable to learn from the circulars descriptive of this apparatus how the air was kept dry.

Dr. Wirt said that he had been using his apparatus for two years, and he too had been unable to understand the description given of the English apparatus. In his own the air was kept dry by proper ventilation.

Dr. Gillette said that he had used this apparatus, and had been much surprised at the amount of heat the patient could stand and the quantity of perspiration induced. He could not speak as yet regarding the results of this treatment.

Dr. Ketch said that they had in the New York Orthopedic Dispensary an apparatus for producing what is called "hydraulic mas-

sage." It was useful in old cases of rheumatism and rheumatoid arthritis and stiffness following sprains. The water is pumped into the apparatus, and passes into a cylinder in a series of jets. It was interesting, he thought, in connection with the apparatus just described.

Dr. Wirt said that the trouble with the hot water was that the temperature could not be carried very high, and hence not much effect could be obtained on the secretions.

A THEORY OF THE ULTIMATE ETIOLOGY OF DEFORMITY AND ITS PRACTICAL APPLICATION.

By ROYAL WHITMAN, M.D.,
NEW YORK.

The erect posture and the use of the limbs proper to that posture are attitudes and uses comparatively recently acquired; and the human body, in its external structure, in its organs, and even in the disabilities and diseases to which man is liable, shows many evidences that it has not yet become adapted to the new and difficult attitude.

The constantly recurring muscular anomalies are not chance variations; they are most often found in those situations where a new function has necessitated a greater change from the general type, and the anomaly is always a reversion to a pattern of the past. Those structures whose function has been lost are subject to degeneration and disease, as exemplified by the vestigial appendix, and those functions most recently acquired, whether mental or physical, are the most susceptible and are the first to show the effect of weakness and injury.[1]

The human embryo,[2] which in its development passes through successive stages reminiscent of ascending types in the scale of evolution, occupies at maturity an attitude of flexion. With the thighs flexed on the body the newborn baby is able to sustain its weight by the convulsive grip of the hands,[3] and it but gradually

[1] Attention is called to the very instructive articles by Frank Baker: "The Ascent of Man," Proceedings of the American Association for the Advancement of Science, 1890, vol. xxxiv.; and "Morphology as a Factor in the Study of Disease," Transactions of the Congress of American Physicians and Surgeons, 1894, vol. iii.

[2] Drummond: The Ascent of Man, 1894. p. 67.

[3] Robinson: Nineteenth Century, November, 1891.

acquires the more difficult function of complete extension and gains the ability to stand erect. In later life flexion is the attitude of relaxation, and it is the newly acquired function of extension that is most easily impaired ; the knees knock together from fear, flexion follows joint-disease, even the nerves that supply the extensor muscles seem more susceptible, as instanced by the wrist- and foot-drop of peripheral neuritis. In truth, the double meaning of the word upright signifies suggestively an attitude both of mind and body, hardly acquired and with difficulty retained.

The orthopedic surgeon has to do with two important classes of deformity. The first class is what is called postural deformity, due to the force of gravity, to what is spoken of as superincumbent weight ; and such deformity indicates that the structure of the body, for one reason or another, is incompetent to sustain the weight and strain which the upright posture puts upon it.

The second class is flexion or contraction deformity, and it is the result most often of chronic joint-disease and of certain forms of paralysis. Why does flexion so uniformly appear under these conditions? This is a question that has been asked many times, and yet it has never received, I believe, a satisfactory answer.

I shall propose, therefore, from a morphological standpoint, the following solution of the problem : If, from any cause, voluntary control of the attitudes or motions of a limb is weakened, and the influence of the lower or reflex centres is relatively or absolutely increased, the affected member will tend to assume an habitual attitude resembling in degree that proper to a lower or quadrupedal type of locomotion. Thus, one may explain deformity which is the result of causes as dissimilar as cerebral impairment and disease of a joint, which are accompanied by reflex muscular spasm. In both the attitude of complete extension, which is the most difficult because it is the last of attainment, which requires the greatest effort when opposed to the force of gravity, and the greatest strain upon the joint surfaces, is the first to become disused, either as the result of local disease or of enfeeblement of the propelling impulses of the motor centres of the brain.

Predominant reflex activity is an evidence of loss of cerebral control. This is perhaps best illustrated in the intense and uncontrollable spasm that follows irritation of the conjunctiva of the eye, but

it is equally evident, if in less degree, when painful disease of a joint unfits it for its higher uses.

If, however, the reflex arc is broken, as in locomotor ataxia, joint-disease does not result in flexion deformity, for in the absence of reflex spasm the limb may be forced to perform its functions, and final deformity is postural, due to the strain of use and to the destruction of the constituents of the joint; and in those forms of cerebral weakness in which the reflex centres are not overactive, deformity, if such be present, is postural, as instanced by the general body-weakness of certain types of congenital idiocy as contrasted with hemiplegic or paraplegic contractions of childhood, in which the propelling impulse and inhibitory force of the brain are impaired.

The reflex muscular spasm that is present in chronic joint-disease is a symptom of local irritation and weakness, and flexion deformity is an evidence of unbalanced nervous energy and loss of cerebral control. With this primary flexion are associated secondary attitudes and distortions peculiar to certain joints. At the elbow, for example, pronation of the forearm, which is evidently a less difficult attitude than the later acquired supination, is the rule. In the lower extremity the primary flexion is modified by the use of the limb in the attitude symptomatic of weakness and pain, by the strain incidental to the support of weight and to locomotion, as well as by the direct effect of the local disease.

Because of the many factors that influence final deformity one may admit the partial truth of each of the theories that has been advanced, which, if it may explain the cause of distortion at a special joint under special circumstances, is manifestly inadequate to explain the underlying cause of flexion deformity, which is not only a primary symptom of painful disease of every joint, but is also present in hemiplegic contraction in which the joints are free from disease and in which pain is absent.

The practical bearing of the theory of deformity that has been advanced is perhaps best illustrated in its application to the treatment of tuberculous joint-disease. The function of the orthopedic surgeon is not simply to relieve the patient from pain and from the constitutional and local effects of the disease, but it is equally his duty to assure, as far as possible, the attitudes most useful to the individual and therefore those proper to the erect posture.

If motion may be preserved, that motion should be about the centre of greatest usefulness; and if fixation cannot be prevented, then fixation should be assured at the point of greatest usefulness.

Reflex muscular spasm is the most potent factor in the causation of deformity, since its degree in no sense accurately corresponds to the destructive effect of the local disease, but depends upon the excitability of the reflex centres; thus flexion appears rapidly and to an exaggerated degree in infancy and early childhood as compared with the effect of disease in later life.

This flexion, at first a symptom, becomes a fixed and permanent deformity by degenerative changes in the contracted muscles and by the pathological and accommodative changes in and about the diseased joint. The symptom of reflex spasm is an evidence of local irritation that is set up and increased by motion and use, functional or otherwise, for which the joint is incompetent. If it were possible to assure absolute functional rest, there would be no muscular spasm and no flexion deformity. Absolute functional rest would not only prevent muscular spasm and thus flexion deformity, but it would assure for the diseased joint the conditions most favorable for repair; and practical experience proves that the more effectively this principle is applied the better will be the result of treatment, whether as regards disease of one joint as contrasted with another or as regards a routine of treatment in which this principle is followed as contrasted with one in which it is disregarded.

The management of tuberculous disease, which is dangerous both to life and limb, is in degree a compromise, as illustrated in the treatment of Pott's disease, in which, although final deformity is in great degree postural, yet fixation in the horizontal position entails such apparent disadvantage as regards the constitutional aspect of the disease that it is usually reserved for emergencies and is not generally accepted as a treatment of routine and necessity.

In the ambulatory treatment of disease at the hip-joint the most efficient brace must assure protection from the jar of impact with the ground; the limb must be made pendant; it must relieve the strain of both functional and incidental motion by splinting the body and the leg; and as such means are by themselves inefficient, traction must be added, because by resistance to the spasmodic action of the muscles it provides a greater degree of fixation, and because

it may, under certain conditions, actually separate the diseased surfaces from one another, and thus more nearly assure local rest. The strain of the erect posture should not be allowed until deformity has been overcome and until acute symptoms have subsided.

That the rigid application of these rules is not always necessary is proved by the favorable results attained by treatment in which they are not followed—results that may be explained in many instances by the slight extent of the local disease or by careful supervision of the patient and the accurate adjustment of the strain of use to the ability of the weakened part, a supervision which is always an essential element in treatment, and which by itself may make an inefficient appliance sufficient for the end to be attained.

Few, I think, will question the statement that whether hip-disease begins insidiously or acutely, final deformity is practically an inevitable result when local support is not applied, and it is a final result also in a very large proportion of cases in which it is applied. It must also be a familiar observation to those who have had experience in the treatment of hip-disease that a splint may effectively relieve the symptoms of discomfort and pain, and yet deformity may steadily increase. If we accept the proposition that the object of local treatment is to assure functional rest, and that it is because of the failure to secure rest that deformity increases, there can be, it seems to me, but little discussion as to the relative merits of the braces that are in common use.

Granting, however, that a reasonable compromise may be made between the application of what is known to be the local treatment that most perfectly affords functional rest, and the means that may be deemed sufficiently effective for a slight degree of disease, or that would seem more agreeable or suitable to the circumstances of the individual, there can be but one test of the propriety of this compromise, and that is its effect. From the standpoint of the ideal result, and from the application of the theory that has been advanced, recurring or increasing flexion deformity is as much a sign of ineffective treatment as the grosser symptoms of pain or the palpable evidence of local disease; and such deformity demands either enforced rest of the patient or increased effectiveness of local support.

As this paper is more concerned in a theory and its application

in general than in details of treatment, I shall illustrate its general applicability as an explanation of another practical point. Judson, who believes the voluntary and involuntary efforts of the patient to protect the joint to be a sufficient explanation of the distortions of hip-disease, insists upon the importance of daily drill as a preventive of final deformity.[1] There can be no doubt of the practical importance of this suggestion, but to account for its efficacy after the theory of deformity that has been advanced I should suggest the following explanation :

Assuming the limb to be from weakness, pain, and resulting muscular spasm, drawn into a position of deformity, a brace is applied, which, by traction on the spasmodically contracted muscles and by the prevention of motion, soothes the exaggerated reflex action and protects the joint from injury ; in other words, the weakened joint is artificially strengthened so that it may sustain the strain of its higher function; then by systematic drill cerebral control is re-established. Just as the child by constant effort gains the ability to stand and walk, so the patient may be trained to adapt the splinted, weak, and awkward member to the attitudes necessary for the erect posture. Without the protection of the brace, training would be of little avail; and without the training the limb would not be used in the proper manner. The same drill would be equally efficacious in degree in the after-treatment of hemiplegic contraction when fixed deformity had been once overcome. In the first instance the primary cause of the flexion is local; it is the result of the peripheral irritation and stimulation of the reflex centres, as well as of the conscious apprehension of the unfitness of the diseased joint for the performance of its proper function. In the second instance the propelling force of the higher centres is impaired, and the unbalanced nervous influence produces the similar deformity.

[1] Complete extension is a newly acquired and comparatively difficult attitude, thus semi-flexion, the attitude of rest or ease, is assumed in painful disease of a joint ; but if great reflex muscular spasm be present flexion is no longer a voluntary attitude, since no effort of the the will can force the limb into the straight position, even if the condition of the joint would permit.

The intelligent choice of attitude influences final deformity, but it is not a necessary factor in the primary flexion, which appears even more rapidly in earliest infancy than in adult life, nor does volition influence the deformity of hemiplegia, in which flexion is as constant as in joint-disease.

In conclusion, I may again state the basis upon which this theory of deformity rests.

If it be true that the upright posture is an evidence of the higher position of man in the scale of evolution, and if it be true that this higher position is due solely to the more advanced development of the brain, which controls the reflexes and forces the members to perform the more difficult tasks which the upright posture entails, it is reasonable to infer that when this controlling force is impaired or removed the member now influenced or controlled by a lower centre will tend to fall backward toward a lower and less difficult attitude.

If, however, the balance of nervous energy is retained, but the structure of the body, either in bone or muscle or other constituent, is incompetent for the strain of an attitude which the stimulation of the higher centre forces upon it, then the resulting deformity, whether general or local, will be properly called postural, because it is due to the force of gravity.

DISCUSSION.

Dr. Wirt said that he believed the author of the paper was working in the right direction, but he would call attention to the fact that, in running, the centre of gravity does not come directly above the support, but there is enough momentum to carry it partly over. The femur, under these circumstances, supports the weight of the body, plus the momentum.

Dr. Phelps thought the author's explanation was mechanically correct; but why was it that in the first stage of hip-joint disease the limb assumes the position of abduction and slight flexion? If it did not assume this position, there would be no limp. The reader of the paper had said that this was because there existed a "bone-sense." This seemed to him exactly like the theory of the reflex. Personally, he believed that the capsule of the joint was swollen from tuberculous material, and as a result, in order to relieve intra-articular pressure, the patient pulls the limb into the partially flexed

position. Naturally, he must swing himself in order to secure the proper balance. If in the first stage of hip-joint disease we pull upon the limb, and relieve the reflex, we can put the limb nearly into a straight position, but then there would be pain because of the pressure within the joint from the disease process. This, he thought, had much to do in the production of the deformity and in bringing these mechanics into play.

DR. BRADFORD said that in certain conditions of hip-disease there was a lack of free motion in the joint, and part of the limp must be due to this cause. In certain conditions of the limp following the cure of hip-disease, where the limb is badly adducted, it would be noticed that the patient threw himself over to one side because of the movement in the lumbar spine. This produced a limp, which was not due to the fact that the femur was not capable of bearing the weight, but because the patient, in order to balance himself, was obliged to throw the body over.

THE PRESIDENT said that one weak point in the argument of Dr. Phelps was that it assumed a voluntary adaptation of the limb as a starting-point. This was not necessary, for the limb more rapidly assumed the position of flexion in earliest infancy, when voluntary selection of one or another attitude which might favor an increase of deformity was out of the question. All these explanations were very interesting, and each contained a measure of truth, no doubt, but not one of them appeared an adequate explanation of flexion as a symptom of paralysis as well as of joint-disease.

DR. WEIGEL said that Dr. Phelps assumed a swelling in the hip-joint. In the early stage of hip-disease, where the joint proper had not even been involved by swelling, there was still a limp, and he would like to know how this would be explained. Some patients, with little or no motion of the joint, walk with scarcely any limp at all, and so do some patients with a good deal of shortening, while others, with more motion and more shortening, exhibit a greater limp. How was this to be explained? Again, those having a decided limp after recovery from hip disease, Dr. Judson had shown could be so educated that the limp would be hardly noticeable.

Dr. Sherman, in closing the discussion, said that he had only given an outline of his paper, which he had been prevented from reading in full owing to its prior publication. In running, the foot-prints are very nearly in a direct line, thus bringing the point of support, as regards the whole body, nearer and nearer to the centre. This was not a voluntary but a reflex act. He would grant that if the Y-ligament were in a position which would cause tension, the limb would naturally assume the position which would relieve that tension; but there were many cases in which there was no effusion into the joint, and in which it was not possible to assume that the starting-point of the signs and symptoms was in the capsule. He believed it to be true that the vast majority of cases of hip-joint disease had the initial focus in the neck of the femur—in other words, that it was rarely, if ever, a capsular disease. In the early stage of hip-disease there was usually no pain appreciable in the neck of the femur—it was simply an unconscious appreciation of the existence of a weak spot. The question of limitation of motion had been considered in the original paper which he had prepared on this subject. Where the limb was adducted, he believed this was due largely to shortening of the neck of the femur, and a corresponding reduction of the lever upon which the weaker abductors must act. The latter muscles were working on a shortened lever and in a shortened space. Barwell said that the patient did not throw his body to the affected side but to the opposite side in cases in which the lesion was in the upper part of the acetabulum. Under these circumstances there was no position which would relieve the diseased part of strain, and the only thing that could be done was to shorten the step so that it should be operative for the shortest possible time. He had never seen but one case in which the patient had been so educated as to do away with the limp. In this case the walk was very good, indeed; but it was very plain that every step was made with effort. The cases which walk without limp after recovery from hip-joint disease were those in which there was complete ankylosis between the bones.

GANT'S FEMORAL OSTEOTOMY FOR THE CORRECTION OF HIP DEFORMITY IN ADULTS,

With a Report of Cases.

By A. R. SHANDS, M.D.,
WASHINGTON, D. C.

In speaking of femoral osteotomy for correction of hip deformity, only a brief account of the technique of the operation and the reasons for preferring this particular operation to the various other bone operations for correction of said deformity will be given, the chief object of this paper being to give in detail a clinical report of the adult cases that have been my good fortune to operate on, and it is hoped when the report is finished you will think it was their good fortune to have fallen into my hands.

When one who has practised the operation reviews the clinical literature on this subject, it is rather surprising that it is not more extensive when the excellent results that can be obtained by it are considered.

In reviewing the volumes of the Transactions of the American Orthopedic Association the writer has ascertained that only two sets of cases have been reported to that Association since its inception to its meeting in 1894, and among those cases only four were adults, properly speaking.

In 1888 Dr. Vance, of Louisville, Ky., reported a series of cases of femoral osteotomies, among which there were two cases thirty-two years old.

In 1894 Dr. Gibney, of New York, reported a series of 100 cases of hip deformity treated in various ways, and in this series there were two adult cases, one thirty years old and the other twenty-seven years old. It was the good fortune of the writer, during his

term as interne in the Hospital for Ruptured and Crippled, New York, to assist Dr. Gibney in operating in his case, reported as being twenty-seven years old; in this case a most excellent result was obtained.

Being impressed with the excellent results I have obtained in my adult cases, both on account of their almost extreme deformity and their advanced age, I have determined to make a clinical report of them my introductory paper to the American Orthopedic Association.

There are several methods of doing femoral osteotomy for hip deformity spoken of in the text-books on orthopedic surgery, but only two are described in detail: one known as Adams's operation, which was first introduced by him in 1889; the other known as Gant's infra-trochanteric osteotomy, which was first introduced by him in 1872.

Gant's operation at the present day has taken precedence of all others for the correction of hip deformity due to bony ankylosis of that joint. The reason for this preference is very evident, as it has a much wider field of application; in fact, it is just as applicable in cases which Adams's operation cannot be done as in any other. Adams's operation consists in dividing the neck of the femur with a saw through an open wound. This operation is inapplicable in cases where the femoral neck is absent or has been partly absorbed as a result of extensive osteitis. When the osteitis has not been extensive enough to destroy the neck the proximity of the operation to the old seat of disease would be very likely to relight the disease by disturbing a mass of encysted cheesy, tubercular material that had been lying dormant for years.

Another objection to this operation is, that it being above the insertion of the psoas and iliacus muscles, it would be extremely doubtful whether a high degree of flexion deformity could be corrected by it without overcoming the resistance offered by these muscles by means of a myotomy, and to do this a very extensive operation would be needed.

The operation of Mr. Gant consists of a subcutaneous osteotomy done just below the trochanter minor, and is applicable in any case, as it is at a safe distance from the seat of the old disease and is beyond the resistance offered by the psoas and iliacus muscles. It is applicable whether the limb is flexed, abducted, or adducted.

The operation done in the cases here reported was performed in the following manner:

The most scrupulous precautions having been used to render the field of operation aseptic, a sand-bag is placed between the thighs and pressed tightly against the perineum by an assistant, who at the same time holds the patient on her side, an osteotome is introduced in the long axis of the femur about a finger's breadth below the trochanter minor, and by manual force forced down to the bone, using no scalpel, the osteotome being sharp enough to cut its own way through the soft parts. As soon as the bone is reached one gentle tap of the mallet will force the osteotome through the periosteum; the instrument is then turned in the transverse axis of the bone under the periosteum; a succession of blows by the mallet will force the osteotome through the bone; the instrument then being partly withdrawn through the bone is tilted up and forced in the same way through the lower fragment; after the same has been done for the upper fragment the fracture should be easily completed by manual force; great care should be exercised, however, not to use a great amount of force to complete the fracture for fear of breaking up adhesions in the joint or splintering the shaft at the seat of operation.

The instrument used in these cases was a Vance osteotome made especially for me, the blade being three-quarters of an inch wide. The width advised in the text-books is one-half inch, but I have found that one three-quarters of an inch wide is much better in adult cases, for here the bones are large and hard.

The only local dressing used was a piece of sterilized gauze and a strip of adhesive plaster to hold it in place. This being applied, a plaster-of-Paris spica was put on, extending from the nipples to the toes after the limb was brought into the best possible position obtainable. While applying the plaster-of-Paris three assistants are needed, two to keep up traction from shoulders to feet, the third being needed to support the hips and keep the limb in the corrected position.

Some surgeons prefer a bed-frame and continuous traction to steady the leg to the use of the plaster-of-Paris spica, contending that it is neater and cleaner, and in that way the wound can be inspected from time to time. My experience has been that the spica, when neatly and comfortably applied, is more comfortable to the patient, as it produces absolute immobilization of the whole limb, which will

prevent any pain incidental to the patient unconsciously turning in bed; furthermore, there is absolutely no danger of the limb getting out of position in which it is placed at time of operation.

Another strong argument, to the writer's mind, in favor of the plaster spica is that my patients have been lifted from bed with perfect ease and comfort and placed on a reclining chair and taken out in the open air, and in this way they have avoided the monotony of a long and tedious confinement to bed. This was done daily with the first case here reported, after about the tenth day, and never for once did she complain of pain about the seat of the operation.

My experience with the subcutaneous osteotomy is that no inspection of the wound is necessary until the plaster-of-Paris is removed for good. If an open operation were done it might be necessary to inspect the wound from time to time; a fenestrum through the plaster, however, would admit that without difficulty.

Case I.—Miss A., aged thirty years, referred to me by Dr. Ida Heiberger, of Washington, D. C., April 1, 1895. The chief trouble complained of when I saw her was a severe and almost constant "backache;" this backache was very much worse at the time of menstruation. She had been treated by various physicians for her painful back, with a negative result beyond that of temporary relief.

At the time of my examination the following history was obtained: At twelve years of age she had hip disease of the left hip-joint; no history of an abscess. Patient never had any treatment except by the family physician; she went on crutches for several years, never used any other protection to the joint. The writer's diagnosis was that it was a case of tubercular osteitis of the hip-joint resulting in one of nature's cures, with an ankylosed joint in an exaggerated deformity.

Patient's general health was good, though a neurasthenic. Upon examination the left hip was found to be flexed to 100° with about 10° of adduction; under ether the joint was found to be firmly ankylosed by bony union.

Comparative measurements revealed little atrophy and but half an inch actual shortening. The gait of the patient was pitiful in the extreme.

As a result of the distorted position of the pelvis in the patient's

efforts at locomotion the uterus was retroflexed, which caused her to be a great sufferer from dysmenorrhœa; to this cause, together with the great strain on the spinal muscles in walking, I attributed the backache that I was asked to treat.

The patient had been treated for the dysmenorrhœa with but little relief by an eminent gynecologist, Dr. H. D. Fry, of Washington, D. C., who informed me that he had attempted to support her uterus in its proper position by means of a pessary, but had been unable to devise an instrument that would remain in position on account of the distorted position of the pelvis in locomotion.

Feeling convinced that the patient could be benefited in many ways by straightening the hip, it was unhesitatingly urged that femoral osteotomy be performed.

On April 5, 1895, under ether, I performed Gant's femoral osteotomy and divided subcutaneously all resisting tendons and bands of fascia from the tuberosity of the ischium to the anterior superior spinous process of the ilium around the internal aspect of the thigh; this allowed the limb to be brought into a good position, a plaster-of-Paris spica was then applied extending from the nipples to the tips of her toes.

With the exception of ether-nausea for several days, which, with the excitement of the operation, caused an attack of hysteria, the patient made an uninterrupted recovery. Her temperature went to 100° within the first twelve hours, after which it never went over 99°.

After the tenth day the patient was put on a reclining wheel-chair and allowed to be taken out into the open air daily. At the end of the fifth week the plaster-of-Paris was removed, when bony union was found to be firm; during the sixth week patient was kept in the recumbent position without protection to the limb. She was allowed up on crutches during the seventh week, and during the ninth week they were discarded altogether.

Three months after the operation measurements showed the limb to be at an angle of 170° and adduction deformity entirely overcome, and the limb one-half inch short.

Six months after the operation patient was again examined, and the new position of the limb found to be unchanged, at which time patient reports that she no longer suffers from dysmenorrhœa and that the backache is very much improved.

Four months after the operation Dr. Fry examined her uterus, and wrote me that he found its position much improved.

The result in this case should be of interest to the gynecologist as well as the orthopedist, as the correction of the deformity relieved the position of the uterus, which in turn cured the dysmenorrhœa.

Case II.—Miss B., aged forty years, applied to me November 10, 1895, to ascertain if anything could be done for the relief of the almost extreme hip deformity she had. She had been deformed for eleven years; the chief reason for her seeking advice at this time was because she contemplated matrimony, but was doubtful whether she should take such a step on account of the disordered position of her hip.

Upon examination I found the following condition of affairs:

	A.	U.	A. S. P.	S.	C.
Right	32½	32	10	17	14
Left	32½	37	00	21	14½

From the measurements it will be seen that she had five inches of apparent shortening, which gave her about 30° of adduction.

This amount of adduction, with the necessary distortion of the lumbar spine to render the legs parallel to enable her to walk, made her about the most pitiful object when walking I have ever seen; her deformity was a source of great mortification to her.

With this condition I advised her not to think of matrimony, and urged an operation to straighten the limb, explaining to her the reasons for her not marrying with her limb in such a position.

The history of her case was very clearly one of bony or firm fibrous ankylosis due to rheumatism, from which she was a great sufferer for several years. The rheumatism, after affecting numerous joints, located itself in the right hip-joint. In about two years all acute symptoms of rheumatism subsided, and for the past eight years she had been in excellent health with no retnrn of the rheumatism.

On January 18, 1896, she was etherized, preparations having been made to do an osteotomy if the rheumatic adhesion could not be broken up with a reasonable amount of force. Force was applied with absolutely no result, the joint would not budge one iota.

Gant's femoral osteotomy was done in the usual way, and the limb put up in a plaster-of-Paris spica. Her temperature never went over 99°; she made an uninterrupted recovery.

On February 24th plaster was removed; firm bony union was found to exist; patient was kept in recumbent position without support another week, making about six and a half weeks all told; she was then allowed up on crutches, which were used for about four weeks.

Three months after the operation the following measurements were taken:

	A.	U.	A. S. P.	S.	C.
Right	32	36½	10	17	14
Left	32½	37	00	21	14½

Thus showing the adduction entirely overcome and one-half inch of real shortening; this, of course, is accounted for in a large measure by the bend in the femur necessary to straighten the limb after the bone was broken.

The great joy given these ladies by relieving their deformities would have well paid me for my labor had I not received a more material compensation.

DISCUSSION.

Dr. Phelps said that during the past year he had been operating upon ankylosed fingers and elbows, and three weeks ago he had operated upon a hip to produce motion. It was well known that if fibrous tissue were got between the ends of the bones in fractures, bony union would not occur. He had taken advantage of this to secure motion. He had cut through just above the lesser trochanter, and then by a tremendous force had drawn the limb down. About three-fourths of an inch of the femur had been removed, and then a portion of fascia had been inserted between the ends of the bones. He would advise, in a case of double hip-joint disease with ankylosis, the performance of excision. This would give a good articulation with a slightly shortened limb—a great improvement. He would operate upon one limb at a time, and would be careful to remove enough bone to prevent ankylosis.

Dr. Foster asked if Dr. Phelps would operate in a case in which there was an apparent tubercular metastasis going on.

Dr. Phelps said that he would treat the case until all active disease had been cured before operating.

Dr. Teschner asked how soon Dr. Shands's patients walked.

Dr Shands replied that they were up about the seventh week.

Dr. Sherman thought that subtrochanteric osteotomy must be limited to cases in which no motion could be developed between the femur and the pelvis. There was in his city a girl of sixteen years, who had recovered from hip-joint disease with the limb flexed and a range of motion of about 30°, but too high up. He had carefully calculated what shaped wedge should be removed. She recovered slowly from the operation because he had opened into a tuberculous cavity. When this patient lay on the table there was absolutely no deformity to be found, and the motion of the limb was good; but on walking the gait was most awkward, all because of the fact that the neck of the femur was short, and there was motion between the pelvis and the femur. The cases which were susceptible of amelioration by this operation must be those in which there is no motion at the hip-joint. This question had come up in regard to an adult only a short time ago, in the case of a woman who had had hip-joint disease when a child, and had much deformity, although she was able to get around quite well. She was very desirous nevertheless of having the limb straightened, as she was to be married, and, as there was complete ankylosis, he had consented to do the operation for her. The limb should be put up well abducted, because it is necessary to obviate the unfortunate position of adduction.

Dr. Townsend said that he had operated upon a patient, forty-five years of age, with bony ankylosis, with good result, and also upon another, forty years of age. He had also assisted Dr. Gibney in an operation upon a patient of about the same age. In all the result had been good.

Dr. Goldthwait said that he had seen several adults demanding such treatment. The first case was that of a man of twenty-eight

years, the second was a girl of eighteen, and the third, a man of thirty-five. These patients sought relief chiefly because of the backache. One of the men operated upon had gained one inch and a half in height, as a result of straightening out the curve of the spine. In this man there had been five inches of actual shortening. The limb was put up with a good deal of abduction, and with 10° or 15° of flexion.

DR. TESCHNER said that he had operated upon a young lady of twenty-one, and although the result had been good, it had been obtained only after a considerable time. There had been considerable ankylosis with the limb at an angle of 120°, and adduction had been quite marked. The operation had been performed in November, 1894. For over one year she could not walk without the help of canes. The shortening before the operation had been eight inches; after the operation it was found to be lengthened one and five-eighths inches. At the present time the patient could walk well for a considerable distance without fatigue, and could dance very well. The limp was hardly noticeable.

DR. MOORE said that last year he had referred to one of these cases upon which he had operated. He was afterward called upon to perform Cæsarean section because of the extreme pelvic deformity present. He would not say that the operation should not be performed when there was some motion, because, although the result was not likely to be so good, it was occasionally quite satisfactory.

DR. RIDLON said that he had on a previous occasion referred to the case of a girl who had recovered from double hip-joint disease with ankylosis, and the knees not more than two inches apart, who, at the age of thirteen years, had given birth to a child weighing seven and one-quarter pounds.

THE PRESIDENT expressed surprise that Dr. Sherman should exclude this operation in cases in which some motion remained in the joint, since this motion became useful after rectification of its deformity. In one of the cases of bending of the neck of the femur that he had reported, he had, by means of an osteotomy, greatly

improved the position of the limb and its functional usefulness, although motion at the joint had been practically unobstructed before the operation.

Dr. McKenzie said that those who had spoken in regard to his case had assumed that the only measure was osteotomy. He would ask why not use *brisement forcé?*

Dr. Townsend said that in Dr. Teschner's case the limb had been so adducted that one could not have made a vaginal examination had it been required. It had been difficult to get the limb in good position and hold it there.

Dr. Wirt said, regarding *brisement forcé*, that in one case now under treatment, that of a boy of twelve years of age, he had intended to do an osteotomy, but finding that the limb could be forced into good position under an anæsthetic, he had not performed osteotomy.

Dr. Henry Ling Taylor said that there was another alternative, *i. e.*, gradual traction by the long extension splint. Of course, this method was not applicable where there was bony ankylosis.

Dr. Shands, in closing the discussion, said that in the first case reported there had been persistent and troublesome backache, so much so that the friends had supposed that there was spinal disease. He thought it was desirable that there should be slight flexion, as it added very much to the comfort in sitting. He had been afraid to use *brisement forcé* for fear of lighting up the tubercular disease.

A REPORT OF CASES OF OSTEOSARCOMA OF THE HIP.

By ARTHUR J. GILLETTE, M.D.,
ST. PAUL, MINNESOTA.

Contrary to authorities I have found, in three instances at least, that osteosarcoma is in more than its early stages difficult to differentiate from other joint diseases, especially tuberculous and rheumatic joints. Certainly after months of disease, when the sarcoma has tremendously enlarged, it is not difficult to differentiate. One would judge from the literature that the enlargement of the growth, local temperature, firmness of swelling—all occurring so rapidly—age of patient, and non-existence of other evidences of diathetic diseases, would make error impossible.

Some two years ago I announced in our programme an article on "Osteosarcoma Simulating Hip-joint Disease," but did not read it, as the histories of my cases were not complete enough to prove my conclusions. For instance, one which I wished to report, rumor had cured, and I postponed reading my paper to ascertain the ultimatum.

The facts in this case are as follows:

Male, aged two years, thigh flexed—the flexion beginning two months prior to my seeing the case. Any movement of the thigh caused pain; there were night cries and complete fixation of the joint; to be brief, a clinical picture of hip-disease except for the enormous swelling of the thigh and pelvis, which swelling extended from the ilium across to nearly the median line of the abdomen and to within half an inch of the umbilicus, and instead of fluctuation a marked induration. Per rectum as far as the finger could reach was felt this "sarcomatous tissue"(?). There was slight temperature. All present agreed that it was a case of osteosarcoma, and the child was sent home to die.

I received several letters from the father, stating that the tumor was still increasing. Still later I wrote the family physician regarding the case, and he replied that he had lanced a large abscess on the inner aspect of the thigh, and stated that the case was now walking, eating, and sleeping well.

I think I should not have had the temerity to report this case here had I not in a burst of confidence related it to a member of this Society, and he expressed great sympathy, as he had had a like experience.

A little more than four years ago I was asked to see a young woman about eighteen years of age, who had just come from the country to be relieved of extreme pain, radiating about the hip and down the thigh to the knee. I found night pain, some limp, slight atrophy, and a slight sensation of roughening of the hip-joint was conveyed to me while manipulating the hip. The family physician feared tuberculous hip-joint disease; but as there was no spasm of the muscles or any shortening, and as he had treated her four years before for inflammatory rheumatism, I was confident that it was not tuberculous hip-joint disease, but must be rheumatic. This was the last seen of the case until nine months later, when I was requested by a general surgeon to see a case of hip-trouble with him. We discovered in this same case a tremendous osteosarcoma involving the entire shaft of the femur and the pelvis. With all of this swelling and disorganization there was no shortening or interference with the movements of the hip-joint.

The following case is of interest, as I was able to get a more complete history and follow the case more systematically:

Male, aged thirty-two years, was sent to St. Joseph's Hospital to be treated for pain in the thigh, knee, and leg, no diagnosis having been made. The seven months previous to my seeing him he had received various kinds of treatment and had been to many physicians. Aside from the pain there was anæmia, loss of appetite, and sleeplessness, and he also complained of intercostal neuralgia. When ordered to the hospital he walked from his room to the

carriage with the assistance of the coachman. Upon reaching the institution he attempted to get out without assistance, and when he stepped on his right leg it gave way with a report which was heard by the coachman on the box. He was carried into the hospital, being unable to walk, and suffering great pain in the hip and knee.

The following day I was consulted; but as his pulse was very weak and irregular, it was thought best to wait before making a more thorough examination. He slowly rallied, and it was two weeks before we administered an anæsthetic and thoroughly examined the hip. During the two weeks' interval his temperature in the evening was as high as 99° F. twice, and any movement of the thigh or leg caused great pain. Indeed, he could only be made comfortable by large and frequent doses of morphine—the bromides having no effect whatever.

Upon etherization I found the leg was somewhat shorter than its fellow. This, of course, I had observed before; it could be easily extended to the same length as the other, however. Upon manipulation there was a distinct crepitus; no giving of the bony tissue could be felt except when the thigh was moved; there was slight atrophy of calf and thigh, though not marked; no enlargement could be felt in the pelvis, although there was a slight enlargement of the inguinal glands. It was, in fact, a case of intracapsular fracture of the hip. I applied a plaster-of-Paris spica with extension weight and pulley. From that time to the time of his death, five weeks later, he did not require an anodyne. The only discomfort complained of was some pain in the back and the intercostal pain. His pulse, temperature, and respiration continued the same; his appetite improved somewhat, and his extreme nervous condition also improved. His temperature was practically normal until just before his death, when it reached its highest mark during the entire eight weeks he was under my care, it being then 99½° F. I certainly was at great loss to account for an intracapsular fracture of the hip in a man of thirty-two from so slight a cause as that of stepping from the carriage to the ground. Then, too, what was the connection between this fracture and the pain and suffering which this man endured for seven months, and for which he was coming to the hospital for treatment? Naturally it suggested a case of osteo-

malacia, the onset being marked more or less by acute pains, which are increased at night, and more acute by movement or pressure. Very often the coxo-femoral joint becomes painful; the motion of the thigh is difficult; in short, pains may occur in any of the bones or joints of the body. This history, with the fracture from so slight a cause and the age of the patient, you can readily see was sufficient evidence to attract my attention in this direction. I naturally turned to the examination of the urine for excess of carbonates, phosphates, or oxalate of lime, according to views of various authors, but found excess of urates and hyaline casts. As the bones did not bend or fracture further, and extension and rest to the joint relieved his pain, I abandoned the thought of its being osteomalacia. As he complained of considerable pain in his back, and there could be felt through the abdominal wall an abnormal prominence at the lumbo-sacral joint, I removed the plaster-of-Paris spica in order to make a more complete examination. I thought the hip-joint slightly enlarged—not marked enough to be positive, yet it certainly looked larger than when I applied the dressings four weeks before. I could find nothing to indicate any spinal trouble further than that already mentioned, viz., prominence of the lower lumbar vertebra anteriorly and radiating pains. He continued in this condition until the morning of December 7th, when he suddenly died, about nine months after the beginning of his trouble.

Dr. Rothrock performed the post-mortem. The following are his notes: "Body of a somewhat emaciated man; slight swelling over the right hip. The joint was abnormally movable, suggesting fracture or disorganization. An incision over the swelling in hip showed it to consist of new growth, involving the upper end of the femur intracapsular, the joint being quite disorganized. On opening the thorax the heart and lungs were normal; on opening the abdomen a metastatic nodule was found on the body of the lower lumbar vertebra. There were also metastatic deposits in the right suprarenal capsule, as well as in the under surface of the liver. Microscopical examination demonstrated it to be a giant-celled sarcoma. The kidneys showed marked evidence of amyloid degeneration."

These cases of osteosarcoma of the hip have demonstrated to me several things which will aid us in early differentiating them from

chronic inflammation of the hip-joint. Certainly it is easy after the tumor appears; but, as you see in these cases, it was months after the onset of the disease before deformity occurred. In both these cases there was not the slightest fixation of the joint, very little atrophy, and no shortening whatever, except in the latter case, after the fracture or disorganization occurred.

DISCUSSION.

Dr. R. H. Sayre recalled a case of osteosarcoma of the hip which simulated an ordinary tubercular knee. It developed shortly after confinement, and had then been supposed to be a rheumatic knee. At the time he had first seen it it had presented the usual characteristics of a tubercular knee. It was treated for upward of a year by mechanical means. Excision had then been determined upon, but at the operation it was found that the case was one of giant-cell sarcoma, and amputation at the hip-joint was accordingly performed.

Dr. Sherman said that a girl of fourteen years had come to him with a swelling anterior to the great trochanter and the limp of hip-joint disease. There was no restriction of motion. A diagnosis of a new growth in the muscles was made. At the time of operation he found it necessary to amputate through the hip-joint. The speaker presented photographs of the patient and of the tumor. The case had escaped from observation until a few days ago. It is now five years since the operation, and the girl is in excellent health, and there is no sign of recurrence. In another case, presenting a very similar group of symptoms, and without elevation of temperature, he excluded tubercular joint-disease and peri-articular abscess. The diagnosis of malignant growth was made and operation advised, but consent could not be obtained.

Dr. Moore said that during the past year he had seen a young man who had received a slight kick from a horse. He had had pain in the knee for about nine months previously. The parts above and below the knee were atrophied, the veins were enlarged, and muscular

spasm was present. A diagnosis of tubercular knee-joint was made. After traction with weight and pulley, and the use of plaster-of-Paris, the man became very much better, and insisted upon leaving the hospital. After a time he began to suffer great pain. Under anæsthesia, examination showed the existence of a sarcoma. On the outer side of the knee, at the point where tubercular abscesses were frequently observed, was what he had supposed to be a characteristic abscess. The man was in such bad condition that amputation of the hip was not considered advisable.

TUBERCULOSIS OF THE WRIST AND CARPUS.

By JAMES E. MOORE, M.D.,
MINNEAPOLIS.

This subject was chosen because it has not been before this Association for discussion yet, and because the writer hopes to bring out the experience of those present in the discussion.

As compared with other joints, this is a rare seat of disease, and one man's experience is necessarily limited. Of 919 cases of tubercular arthritis collected by Cheyne, only six were of the wrist and hands. Most writers state that wrist-joint disease constitutes from 4 to 5 per cent. of all cases of joint disease.

A peculiarity of this disease is that it occurs most frequently between the ages of fifty and sixty. Cheyne says that he believes the synovial type prevails here, but says that it is difficult to prove. Senn says that the synovial type is most common. Every case operated upon by the writer has been of bony origin. The radius is the most frequent seat of disease, and the proximal ends of the metacarpal bone next.

The causes of tuberculosis here are the same as in other joints, save that in a majority of cases of tuberculosis of the wrist it begins in matured tissues instead of growing tissues. It would also seem that tuberculosis of the wrist is more closely connected with a general tubercular condition than the same disease in other joints.

Although this joint is so situated that it is very subject to traumatism, this disease is rarely the result of an injury. The only case under the writer's care due to an injury was one in which the patient was already suffering from a tubercular empyema, and who finally died from pulmonary tuberculosis.

The pathology of tuberculosis of the wrist and carpus does not differ in any way from the same disease in other joints. The sheaths

of the tendons are very liable to become affected secondarily, and add very materially to the gravity of the disease. They sometimes become primarily affected, a fact that should be remembered in making a diagnosis.

This disease comes on insidiously, usually without the pain and muscular spasm so characteristic in most joint diseases. Swelling with tenderness and weakness of the joint are usually the first symptoms noticed. The swelling is on all sides of the joint, but is most marked on the dorsal surface. When the tendon sheaths are involved the swelling extends further up and down the arm. Local heat and atrophy of the arm are well marked. Slight flexion usually occurs and the digits soon assume a straight position, the thumb being parallel with the others and close to the index finger. While the pain is seldom severe, the joint is apt to be quite sensitive to the touch.

Owing to the absence of pain and the insidious manner in which the disease comes on, it is seldom brought to the surgeon until it is so well developed that the diagnosis presents no difficulty. It can usually be made at sight when the above symptoms are present, for the appearance is quite characteristic.

A tenosynovitis occurring independently of the joint affection resembles the joint affection somewhat. In tenosynovitis the swelling is not so evenly distributed, and may be confined to one or two tendons. It extends up and down the arm and can be felt in the course of the tendon. The tenderness is elicited by direct pressure and not by pressing the joint surfaces together. Ligamentous crepitus may be present. Atrophy is not so marked as in wrist-joint disease.

The prognosis in wrist-joint disease is always grave—much more so than in most other joints—because of the decided tendency to the development of pulmonary tuberculosis. In adults it almost always ends this way. In children the immediate prospect of recovery is very much better, but they rarely live to maturity. When the tendon sheaths are involved the prognosis is very grave indeed. The functional results after treatment in children are good, but in adults they are bad.

The treatment of this disease involves much responsibility, because of the gravity of the prognosis. Many times the surgeon is

called upon to advise what would be considered very heroic treatment in any other joint, because of the imminent danger of pulmonary complications.

In children extensive suppuration rarely occurs, and the proper treatment is rest. This is easily secured by plaster-of-Paris extending from the elbow to the knuckles, the arm being carried in a sling, and held half-way between pronation and supination. Six or nine months of this treatment will often yield a satisfactory result.

Operative measures are rarely indicated in a child for this disease. Excision in a child is never advisable, because the results both as to function and life are bad.

In adults, the line of treatment is very different. The outlook from rest-treatment is anything but encouraging, and operative treatment is often indicated.

When the case is not too far advanced, when there are no sinuses and no pulmonary complications, the treatment is the same as in childhood, and can be carried out in the same manner.

When suppuration and sinuses are present in an adult operative measures are indicated, because of the danger of phthisis. Unfortunately, the outlook is grave in such a case with any treatment, but experience has taught us that it is less grave when operative measures are judiciously resorted to. The choice of operation lies between extensive excision and amputation, for arthrectomy, owing to the anatomical structure of the joint, is out of the question, and scraping and gouging are worse than useless; they are dangerous.

Early excision, as recommended by Langenbeck and others at one time, has not become popular, because the functional results are bad, and as a life-saving measure it does not compare favorably with amputation.

When the disease is well-marked and progressing rapidly, or when the tendon-sheaths are involved, amputation is the best treatment. When there is well-marked wrist-joint disease with beginning phthisis, amputation should be performed. When there is well-marked phthisis with wrist-joint disease, which is causing the patient much suffering, amputation is the best treatment, because the wrist-joint will never recover, and will be a constant source of suffering and annoyance to the patient as long as he lives.

On the other hand, when amputation is performed under such circumstances, the lung trouble often shows marked improvement.

These problems are frequently brought before the surgeon, because tuberculosis of the wrist rarely continues any length of time in an adult without the presence of pulmonary tuberculosis, and not infrequently the two diseases are present when the case first comes to the surgeon. The fact cannot be too forcibly stated that amputation in such cases is often truly conservative.

When the disease is not too extensive, when the tendon-sheaths are not involved, and the patient is in good health, excision may be considered. The operation, when undertaken, should be very radical. The extremities of the radius and the metacarpal bones should be removed with the whole of the carpus. Anything short of this is disappointing and dangerous.

The double posterior incision of Lister is the best operation in common use, since it affords the readiest access to the diseased structures. The Esmarch bandage should be applied so that the operator can see just what he is doing.

It is absolutely necessary that every particle of diseased tissue should be removed. The wound should be thoroughly iodoformized and closed, without drainage, if possible. The part can be very conveniently kept at rest by means of a plaster-of-Paris dressing applied over the surgical dressing.

The writer believes that any interference with the part, with the hope of securing a movable joint, is unwise, because after so radical an operation any such effort is likely to fail, and may result in a relapse. The patient has every reason to be congratulated if he secures a sound arm without movement at the wrist.

The writer has been greatly pleased with the suggestion of Studsgaard, of Copenhagen, that the diseased tissues in tuberculosis of the wrist and carpus be reached by splitting the hand between the metacarpal bones. There is no anatomical reason why this cannot be done, and it would certainly admit of much freer access to the diseased part than any other operation with which we are familiar. Dr. Mynter reported a case to this Association, two years ago, in which he split the hand between the second and third metacarpal bones and found very ready access to the joint.

Everyone who has performed an excision of the wrist by any of

the recognized methods will bear me out in the statement that it is a difficult matter to remove all diseased tissues without injury to surrounding healthy tissues.

The writer has had no experience with iodoform injections in wrist-joint disease, but believes that it is worthy of trial in adult cases that are not severe enough to demand operative interference. Senn reports very satisfactory results. The needle can be introduced at almost any part, and the emulsion forced in. This treatment certainly has the great virtue of being perfectly harmless when properly performed.

DISCUSSION.

Dr. McKenzie said that he had seen a case of very extensive wrist-joint disease in a man of nineteen years. He had advised in this a very free use of injections of a ten per cent. solution of iodoform in glycerin with the very best results, so far as the recovery from the disease was concerned. There was a fair restoration of the function of the hand, although, of course, the motions of the fingers were very much restricted. He had advised massage for this. He had had equally good results with iodoform injections in other cases, although his records had not been so carefully kept as in Dr. Sherman's cases. His temperature records showed no great reaction after these injections; indeed, he had observed a reduction of the pyrexia following the injections.

Dr. Sherman said that his experience with wrist-joint disease was very limited. He wished to commend the classification given in the paper. He had had a few cases in children recover in a few months. If a wrist-joint were bad, it was better to amputate. In the last case of the kind he had seen he had performed excision instead of amputation, the object of the operation being simply to make the patient more comfortable for the brief remainder of his life.

Dr. Wirt said that he had just seen a case of wrist-joint disease in a man, thirty-three years of age. He had had it for ten years,

He thought now after hearing Dr. McKenzie's remarks that he would try the iodoform injections.

Dr. Gillette said that he had been surprised to hear the statements made regarding the amount of pain from this condition, for he had been under the impression that there was but little pain associated with wrist-joint disease.

Dr. Moore, in closing the discussion, said that he had simply advised amputation in those cases in which pain was one of the reasons. Exceptionally this was the case. He had done amputation in one case simply because of the intense pain. The patient's life was certainly considerably prolonged by the amputation, and during this time his general condition was greatly improved.

INGROWN TOE-NAIL MECHANICALLY TREATED.

By HENRY LING TAYLOR, M.D.,
NEW YORK.

The condition known as ingrowing or ingrown toe-nail consists essentially in an infected and irritated ulceration of the soft parts at the margin of the nail. Improper shoes, a careless toilet of the nails, or accidental causes may produce an abrasion which in most situations would be trivial, but here becomes readily infected by the imprisoned germs, which greatly thrive in the genial warmth, moisture, and darkness of that ideal incubator, the swathed foot. Under these conditions and with the constant irritation of the impinging nail, flabby, pulpy granulations press up against the nail-edge, the part becomes swollen and tender, and if walking is attempted the result is like drawing a file from time to time over an unhealthy sore. This condition often gives rise to chronic misery, varied by acute pain on attempting to walk; frequently the shoe cannot be worn unless cut over the toe; so that the sufferer may be completely disabled and unfit for work for an indefinite period. That relief is not always readily furnished may be inferred from the large and increasing literature, and from the new methods of treatment brought forward from time to time. Volume IX. of the *Index Catalogue*, published in 1888, gives titles of 17 monographs and 153 journal articles on this subject. Most methods of treatment recognize the paramount importance of protecting the ulceration from the pressure of the nail-edge. The various operations recommended aim to do this by excising the whole or a part of the nail, the granulations, or both; or by so altering the shape of the parts that the nail-edge and the ulceration do not meet. The best operations have the advantage, under favoring conditions, of furnishing tolerably speedy and certain relief; they have the disadvantage of inflicting more or less mutilation.

The mechanical methods consist in raising the impinging edge of the nail by inserting bits of gauze, lead-foil, or other substances beneath it, or by pressing away the granulations by a small and carefully adjusted compress. If the nail has not been cut short at the corner, the first plan will often succeed. Better protection, however, can usually be given by employing the following method, slightly modified from that used by Mr. H. T. Masters, of Whitechurch, England, and mentioned in Pye's *Surgical Handicraft*, vol. ii. p. 523. A flat strip of silver $\frac{1}{100}$ inch thick, one-eighth of an inch wide, and an inch long, is bent by means of small forceps into the shape of a fish-hook. The hook will usually fit the toe better if shaped from a strip of metal slightly curved on the flat, and so bent that the shorter edge will be in front. In this case the hooks are of two kinds, rights and lefts; for many toes the straight hooks answer

perfectly well, and can be used on either side. After cleansing the toe with hydrogen peroxide, and placing a pledget of cotton soaked in a 4 per cent. solution of cocaine in contact with the granulations, the hook is inserted beneath the lateral edge of the nail in such a manner that the latter rests in the depression answering to the barb, while the shank of the hook curves over the side of the toe and close to it. (See Fig.) With a little knack the hook is readily put in place; the more the ulceration the less the pain, since there will be more room for the hook. A little gauze is placed over the toe to absorb discharge, and the hook is held in place and pressed upward against the lateral edge of the nail by a few turns of gauze bandage or adhesive plaster wound around the toe. After a few hours the patient usually suffers no inconvenience from the hook if it is properly placed, and is very soon relieved of the pain due to the irritation of the nail.

In a few days the swelling and redness subside, the granulations shrink, and in two or three weeks the ulceration is healed, or is well on the road to it, and complete recovery quickly follows. After the insertion of the hook the dressing is to be changed and the hook adjusted when needful; after the first week once or twice a week will do. It is well to wear the hook for several weeks after the ulceration has healed, in order that the newly-healed tissues may have time to harden, and also to hold the nail up until it is fully grown out. This often helps to give the nail a better shape, and prevents recurrence. The patient should be directed not to cut the nail short at the corners, but to let it grow square. The result of management on this plan has been very satisfactory, and the method is applicable to the severest cases, the only limitation being when the nail has been cut off so short that there is no edge to hook under. Under these circumstances a delay of a week or two to give the nail time to grow may be necessary; I have seen one such case. The cases that I could control, and some were of several years' standing, got well in a few weeks; the length of time necessary to cure is hardly a drawback, since the patient is comfortable and able to go about. In patients not readily controllable operative measures may often be preferred. As in any kind of mechanical treatment, this little manœuvre calls for a certain amount of painstaking, dexterity, and judgment. We must see to it that the hook is actually doing, from start to finish, the work we have put it at, or it becomes merely a foreign body imbedded in the toe. In order to test the matter I have several times inserted the hook without cleansing and dressing the toe, and still have had good results, showing that the cellular forces of the organism are often able to cope with germ life, if factors calculated to depress their vitality, in this case the impinging pressure, are removed.

This well illustrates the differing behavior of diseased and infected joints under adequate mechanical treatment and when left to themselves. In the one case pressure, tending to devitalize the tissues which feel its force, is removed, and the tissues unmistakably take on a healthier action and tend to heal. In the other case local destruction may proceed indefinitely; there is little tendency to heal, and cure finally takes place, if at all, only after considerable loss of substance.

DISCUSSION.

Dr. R. H. Sayre said that he had but little trouble in curing ingrowing toe-nails without resort to operative measures, but the method presented in the paper seemed to him an excellent one. Common sense and the wearing of proper shoes and stockings were largely to be relied upon in the cure of ingrowing toe-nails.

ON THE COMPRESSION OF THE FRONT OF THE FEET.

By E. H. BRADFORD, M.D.,
BOSTON.

On a shelf in the Peabody Museum at Cambridge a valuable collection of prehistoric foot-prints in volcanic mud from Nicaragua can be seen. The fact that they were found twelve feet under

Fig. 1.

Prehistoric foot-print in volcanic mud (Nicaragua).

ground, beneath a deposit which must have required ages to accumulate, is proof that they are of great antiquity. The impressions are of shapely, muscular feet, with a well-formed arch.

If the observer, prompted by an examination of these foot-prints, watches the tracks of pedestrians on a sidewalk covered to a depth of a few inches with freshly fallen snow, or on a thawed path with a thin layer of mud, the fact forces itself upon the attention, that shoes as worn by our civilization must bind the front of the feet to a degree which cannot but be injurious to perfect gait, as well as to the shape of the feet. This opinion is supported if anyone watches a number of people in our streets, and notices the fact that a large

FIG. 2.

Drawing from statue in a museum of Boulak, B. C. 2000, showing slight angular divergence in walking.

number walk with but little use of the front of the foot, throwing the weight as if they stepped from heel to heel rather than a regular heel-and-toe gait. In contrast to these foot-prints, the gait of barefooted boys upon a dusty road, or upon a sand-beach is of interest, and shows clearly how the natural gait differs from that of those with feet the front of which are bound by shoes. This is confirmed by anyone who has watched the free stride of barefooted races, or

examined the photographs of sandal-wearing people; and indicates that our civilization may have injured the strength of the human foot—a civilization which has raised mankind from a race of hunters and nomads to a population which avoids, by riding or driving, foot journeys.

An examination of antique and classic sculpture shows in a measure the shape of the feet in the earlier ages. The Egyptian statues give evidence of a broadening of the feet in a sandal-wearing people; also the fact that in sitting and standing the feet were kept nearly parallel and not turned out. The Egyptian hieroglyphics and bas-

FIG. 3.

Drawing from a photograph of a weak ankle seen from behind, showing the sinking inward at the metatarsal articulation, which can be prevented by abduction of the great toe.

reliefs show clearly that, though a sandal-wearing people and a laborious people, a high arch was probably the rule, as it is always indicated in the feet, even of the working class. The Assyrian bas-reliefs show muscular feet with well-shaped arches, as

is the case with the Toltec sculptures. In Greek art at its perfection, the shape of a perfect foot is well preserved, the phalanges being always kept on a line of the metatarsal bones, the space between the first and second toe being well marked. The statues are all well placed upon their feet, and the eversion of the foot, or

FIG. 4.

a *b*

Imprint of normal foot.

(*a*) Weight thrown chiefly upon the heel ; slight weight on the front of the foot.

(*b*) Weight thrown entirely upon the front of the foot, showing the separation of the toe and the abduction of the first metatarsal.

a wide angle between the axes of the feet in standing (characteristic of a weak foot), is not seen, except to a slight degree in the later and debased Greek art. The ideal shape is perhaps best represented by the famous foot of the Hermes of Praxiteles.

It is noticeable in all of the best Greek statues that the separation of the great toe from the second toe in standing and in walking is well

marked, a fact indicative of a sandal-wearing people, and in a measure lost in modern shoe-cramped feet. In the famous statue of the disk-thrower, unusual strength of the flexor muscles of the phalanges is indicated, a strength which does not exist in modern shoe-wearing people. In the art of the Renaissance the shape of the foot is often neglected or badly copied from the classics. Modern sculpture neglects careful modelling of the foot, or imperfectly follows classic

FIG. 5.

a *b* *c*

Foot-prints and prints of shoes.

a. Print on smoke-paper of a pointed shoe.

b. Imprint of foot wearing pointed shoe, both indicating the compression of the front of the foot.

c. Print of a workingman's shoe, showing proper room for toes.

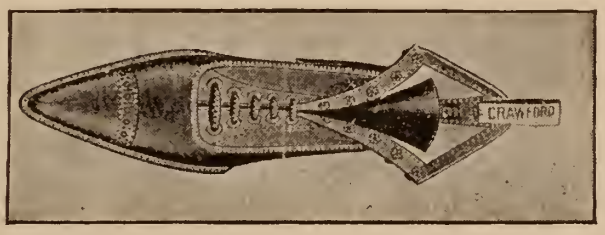
models. Some of the modern realists in sculpture present in their studies the common distortion of the great toe, almost universal in shoe-wearing people, and in many of the modern statues the eversion of the feet, seen chiefly in those with flat-foot or weak feet, is found, copied in all probability from a badly shaped model. When as careful and thoroughly trained artists as Falguière and Gerome depict a foot distorted with a hallux valgus as belonging to the types of phys-

ical beauty there is sufficient reason for believing that the normal shape has not been carefully studied. Pisano, the father of realists in sculpture, in the monument to Scovegni at Padua, reproduces a deformity of the foot from shoes, even in the sixteenth century, which would equal modern specimens.

From the evidence afforded by sculpture, it is clear that the antique barefooted races—the Assyrians, Egyptians, Toltecs—were not flat footed, and this opinion is supported by an examination of the feet of both sandal-wearing and barefooted people of the present day.

Although shoes are not essential to locomotion, for convenience and comfort shoes of some sort are worn by all people, even savages, when this simple luxury is possible. The primitive shoe is made of raw hide or leather, shaped about the feet, conforming entirely to the shape of the foot, and this is true of all simply-made shoes. The modern shoe, however, is shaped on a last, and made, not in accordance to the shape of the foot, but according to the custom and fashion of the day, to which the foot must conform so that the shoe may be regarded as a bed of Procrustes. The shape of the last is never an

Fig. 6.



Modern shoe, necessarily compressing toes.

anatomical one, but always a conventional one; it is usually pointed more or less, and the narrowest part of the shoe is always where it should be widest, namely, either at the toes or the front of the boot. When the foot slips forward the toes are necessarily crowded, and the natural spread of the toes at the end of the step is prevented. As shoes are made, the part which stretches the most from the wearing of the boots is the part behind the toes; the boot, therefore, becomes looser and broader except at the tip, and this increases the crowding of the toes as the foot slips forward.

The result of this is not necessarily harmful, as the toes can submit

to a good deal of crowding, in people walking ordinarily with a heel-to-heel gait; but in many instances an injurious crowding of the toes results and various deformities are developed which, although giving rise to but little annoyance during youth, materially interfere with locomotion in old age. Of these in-toe, crumpled toe, overlapping toe, injury to the transverse arch, weakened foot, and flat-foot may be mentioned as the most common.

FIG. 7

Photographs of casts of feet distorted by improper shoes. (From WALSHAM.)

The most important of the evil effects of modern shoes is seen in weakening the power and limiting the action of the great toe, resulting in the more severe cases in a distressing degree of deformity, technically termed hallux valgus.

A comparison of the bones of the human foot with that of the larger monkeys shows that, in the propulsion of walking, the great strength of the first metatarsal and phalanges of the great toe is of importance. It will be also seen that separation of the great toe from the other toes is allowed for by the facet of the first cuneiform,

which inclines to the inner side. The object of this adduction of the great toe is to add greater strength to the foot as a means of support. If the bared foot of a young child or of an adult, where the muscles have not been weakened by shoes, is examined, it will be found at the end of the step when the weight falls upon the front of the foot the separation of the great toe from the other toes takes place. This is due to the adduction of the first metatarsal, and thereby the base of support is noticeably broadened. After shoes are worn this power of adduction of the greater toe is diminished, and in many cases entirely lost. Where pointed shoes are worn, or shoes which prevent the inward turn of the great toe at the end of the step, the great toe is not only weakened but pressed somewhat to the outer side, a slight degree of this deformity being almost universal in shoe-wearing people. In many instances this outward deviation of the great toe becomes a serious deformity, developing exostoses in old age from continual attacks of periostitis of the head of the first metatarsal, which being unprotected by the phalanx is exposed to irritation and develops a subacute ostitis. As a complication, an inflammation of the skin and underlying bursa, known as bunion, is developed, which increases the discomfort.

But even where through the strength of the ligaments the great toe does not develop so marked a deformity, the fact remains that its muscles are weakened by the cramping of shoes, which obliges the individual to turn the feet out more in walking than is normal. Barefooted races walk with but slight divergence of the feet, for the reason that at the end of the step the adduction of the great toe broadens the foot enough to support the weight readily. Where this is not possible the feet are turned outward to increase the size of the base of support. This brings a greater strain upon the tibial muscles, and places the foot in a position to develop the so-called flat-foot, especially in individuals who are obliged to stand continuously upon their feet, as waiters and nurses.

It is hardly to be hoped that a reform in the shape of shoes worn by adults can be brought about by the efforts of physicians. People wear shoes according to their fancy, and physicians are no more consulted as to the shape of the shoes to be purchased than as to bills of fare furnished at hotels. It is to be hoped that in time a gradual improvement will take place, and, in fact, something of the

sort has already been accomplished in the shoes for men. Efforts in the right direction have been made, and further effort will also follow. It is certainly desirable, however, that physicians should make an earnest effort in regard to the shoes of the children.

FIG. 8.

a *b* *c*

Prints of children's shoes.

a. Compression of the toes. *b* and *c*. Giving room for toes.

An examination of the feet of a number of children makes it evident that not only is the weakness of the muscles of the front of the foot developed at a very early age, but the distortion of the toes from shoes is present in fully two-thirds of the cases of children over two years of age who present themselves, an evil which can easily be prevented if shoes are properly made. It should be borne in mind that in children's shoes the broadest part of the shoe should be, not as is ordinarily made, in the middle of the foot, but at a cross-line from the end of the small toe to the base of the first toe, and should allow for the free play of the great toe to the inside at the end of the step. This not only prevents injurious crowding of the toes and weakening the muscles, but it allows the support to be added which was designed to check the inward rolling out at the medio-tarsal joint, which, when excessive, develops what is known as flat-foot. In the foot, when additional weight is thrown upon it, what may be termed a sagging of the arch to the inner side takes place as the tibial muscle becomes relaxed. A twist of the foot at the medio-

tarsal joint takes place; this occurs in a slight degree even if the weight falls chiefly on the back of the foot; but if the weight falls as well on the front part of the foot, this change is to be seen, especially in people with weak muscles. This inward sag drags the head of the metatarsal bones inward, together with the cuneiform bones and the head of the astragalus and os calcis and cuboid. In a normal foot, however, this can be checked by the adduction of the first metatarsal separating the great toe from the other toes, by acting as a prop to limit the rolling of the foot. This inward inclination of the great toe is seen in young children and in the barefooted and sandal-wearing nations.

Adults can withstand this binding of the front of the foot from shoes with much less injury than the weaker bones and ligaments in the feet of children. If this compression of the toes is guarded against in children, much can be done to prevent the future development of deformity. Even if it is difficult to induce adults dominated by custom to change the fashion in the shape of shoes, it is entirely feasible to induce the thoughtful community to furnish its young children with proper shoes. What the shape of these should be can easily be recognized by physicians if the above well-known facts are borne in mind, and if it be remembered that the sole should not be simply straight in its inner edge, but curved slightly inward, and so made that, when the weight is thrown upon the foot wearing a shoe, a perpendicular line from the edge of the astragalus should fall but little to the inner side of the line from the toe to the heel.

When the painter David wished to immortalize Mme. Recamier, he painted her reclining with bared arms and feet of a shapeliness which cannot but command admiration.

Perhaps in the twentieth century efforts may be made to preserve the shape of the feet, as the nineteenth has attempted to do for the beauty of the teeth and hands. At present it is the boot which is admired, not the foot, to the injury of the latter.

It is well to remember that it is not the tail which separates man from the anthropoid apes, but the shape and strength of the foot, especially of the first metatarsal and its accompanying phalanges. It is that which gives to man the erect gait, and it is a mutilation not to preserve this given strength.

Investigations on Flat-foot.

Dr. Bradford presented a number of plaster-of-Paris casts which illustrated the value of Dr. Whitman's flat-foot plate. He also presented a series of lantern-slides illustrating flat-foot and its development and causation. There were many views intended to demonstrate the fact that barefooted people have strong and well-arched feet.

DISCUSSION.

Dr. Whitman said that in a study of this subject, some years ago, he had come to similar conclusions. In prescribing shoes, he thought the shoes should be ordered sufficiently wide to allow a certain amount of independent motion of the toes, the sole of the shoes not be of the usual rocker shape, but should be made flat, so that the toes might be actually used to assist in the work of the foot, and so relieve the arch of a certain amount of pressure. The advance in our knowledge of flat-foot within a short time was very interesting. Ten years ago it was usually considered as a hopeless deformity; at the present time it is looked upon as an affection most easily prevented and very readily cured.

Dr. Wirt said that last year a paper had been read before the Association about the high arch, yet he had heard nothing about it since then, and would like further information regarding it.

Dr. Bradford said that he had but little to say regarding the contracted foot, because he had not studied it thoroughly. It had always seemed to him that the high-arched or contracted foot must be due to one of two conditions. It might result from a temporary infantile paralysis which allowed a dropping of the foot and contraction of the plantar muscles of the foot. The condition might also result, he thought, from a shortening of the fascia, analogous to Depuytren's contraction. It seemed very probable that there might exist a condition of thickening or a low grade of inflammation of the plantar fascia analogous to the same condition in the palm, although

differing somewhat, owing to the anatomical differences in the structures. This he had supposed was the result of imperfect shoeing.

Dr. McKenzie said that for some time past this question had been a mooted one with him, and he had therefore studied the literature of the subject. In a book recently published by Walsham and Hughes a number of theories were presented, but no definite opinions expressed. The favorite theory was that it was due to paralysis of the interossei muscles—an entirely inadequate theory in his opinion. Quite recently a case had come under his observation which was of interest in this connection. It illustrated the fact that whatever might be the exact etiology, heredity played a prominent part. He had been consulted by a clergyman, forty-five years of age, who walked very badly, and who presented this condition strongly marked in both feet. He said that in the first years of his life he could stand, walk, and run as well as other boys. He had never had any distinct illness; there was no history of infantile paralysis. An older brother of this man, a farmer, had the condition still more marked, and it constituted such a disability that he had been compelled to give up his work. An aunt and a sister had the same condition, and his little girl, twelve years of age, also showed the same affection, though less marked than the father. This was the only instance he had met with in which it had been so strongly marked in a family, although in other cases he had found other members of a family would present a short, stubby foot. The explanation given by Dr. Bradford would account for the drawing up of the toes, yet in the cases just referred to the causes which Dr. Bradford had mentioned had not come into play.

Dr. Bradford said that it was certain that the Chinese ladies had non-hereditary contracted feet; and, although it might occur in persons who wore sensible boots, it was impossible to say that such an individual had always worn sensible boots. The chances were all in favor of his having worn bad shoes, at least in childhood, for it was very difficult to get for young children properly made shoes. It was, of course, possible that in many of these cases bruises or strains might occur in the arch of the foot, and by setting up a low grade of inflammation result in a contracted foot.

DR. WHITMAN said that he thought extreme cases of contracted foot were usually due to anterior poliomyelitis. In such instances the foot was not only very much contracted, but there was also marked shortness of the calf muscle, and corresponding weakness of the dorsal flexors; again, there were undoubtedly cases corresponding to Dupuytren's contraction. Then there was the subacute inflammation of the plantar fascia during or after infectious diseases, which resulted in sensitiveness and thickening, which might cause contraction later. A shoe with a high heel and curved sole, by tipping the toes up in the air, threw the weight on the heel and the heads of the metatarsal bones, and thus caused deformity of this character. Some individuals were born with low arches, and others with high arches; these were some of the causes that might be considered in the etiology of this affection.

DR. RIDLON asked Dr. Whitman whether these cases of contracted feet, which he attributed to anterior poliomyelitis had been seen at the age when other infantile paralytic deformities were apt to occur? He had seen quite a number of cases of contracted feet, in almost all of which the condition had developed in adolescence or early adult life. He had not seen any of these cases develop in children at the age when the ordinary cases of anterior poliomyelitis generally appear. He had certainly observed badly deformed feet in those who had not worn tight stockings or tight shoes, and who had been barefooted for a good part of each year during childhood and adolescence. The best shaped woman's feet he had ever seen were in a fashionable woman of New York City, who had never gone barefooted, and who wore the tightest and most-pointed shoes imaginable. He had been unable to reconcile these observations.

DR. BRADFORD said that this lady might have worn proper shoes during childhood, so that having developed a strong foot, the use of these tight and pointed shoes did not do as much harm as they would ordinarily have done. It was especially important that children between the ages of two and six years should wear roomy shoes.

DR. WHITMAN said he had explained the diversity of symptoms in different cases and the resulting deformity by the amount of work

required by the feet. The person referred to by the Secretary probably walked but little, and probably also wore very thin-soled shoes, which allowed the foot to expand somewhat. He had recently treated a young man, nineteen years of age, who had come to him with the statement that he had had some trouble with his feet nearly all his life, but had now become completely disabled. Examination showed that he had contracted feet. Dorsal flexion was possible, but only to within 10° of 90°. On division of the plantar fascia and tendo Achillis on both sides he was unable to forcibly flex the feet beyond a right angle with the legs. This showed very conclusively that the feet had been distorted for many years, and the changes in the bones were such that they prevented further reduction of the deformity. The case was undoubtedly one resulting from a slight and temporary anterior poliomyelitis in early childhood.

Dr. McKenzie asked Dr. Whitman if he would expect to find as many cases of anterior poliomyelitis in one family as in that which he had described?

Dr. Whitman replied that he only looked upon anterior poliomyelitis as one of the causes of the condition.

Dr. Ketch said that only ten years ago, in an article on club-foot, he had called attention to the fact that flat-foot was one of the most common forms of acquired club-foot which the orthopedic surgeon was called upon to treat. He believed that notwithstanding the fact that very few people wear proper shoes, flat-foot must frequently develop about the age of puberty—in other words, at the time of most active physiological growth. At this time it was important that parents should be instructed regarding proper shoes for children. The contracted foot he had most commonly seen in connection with anterior poliomyelitis. He had seen it in cases in which the paralysis had disappeared from one side, but had remained in the other side.

Dr. Ridlon remarked that his experience had been that the contracted foot was almost always bilateral.

A METHOD OF MAKING STEEL-SUPPORTS FOR FLAT-FEET.

By JOHN C. SCHAPPS, M.D.,
BROOKLYN.

It is the object of this paper to present a method of making both the arched steel-soles of the ordinary pattern and the Whitman brace, which will render them available to anyone who can handle a few common tools. It has been in use at St. Mary's Hospital, Brooklyn, and in private practice for six years, and I have yet to find a case that is sufficiently flexible to permit of any support to the hollow of the foot to which the soles thus made are not applicable.

The method originated in this way: a steel-sole was hammered out by hand to correspond to the arch of a well-developed adult foot.

Fig. 1.

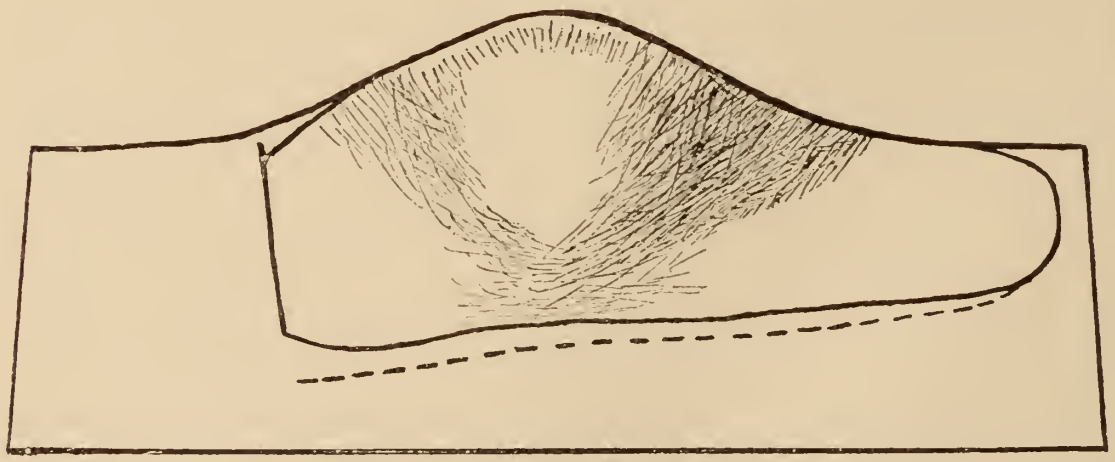


Plate marked for left foot of man.

It was observed that the anterior and posterior halves of the arch were not very different. The sole-plate was modified so as to make these the same, and the shape was then somewhat like a portion of the convex surface of a cone, with the apex directed toward the

outer side of the sole and the base toward the inner side of the foot. The lines running from the base to the apex were, however, curved, and lost themselves in the plane upon which the patient stood. From this plate plaster-casts, and from them iron dies, were made. By means of them any mechanic can make the steel soles. The lower die (Fig. 1) is placed on an anvil, a piece of soft sheet-steel (what is known as pickled and cold-rolled, No. 18 or 20 Stub's gauge, serves admirably) is cut to the desired shape (Fig. 2), heated, slightly

FIG. 2.

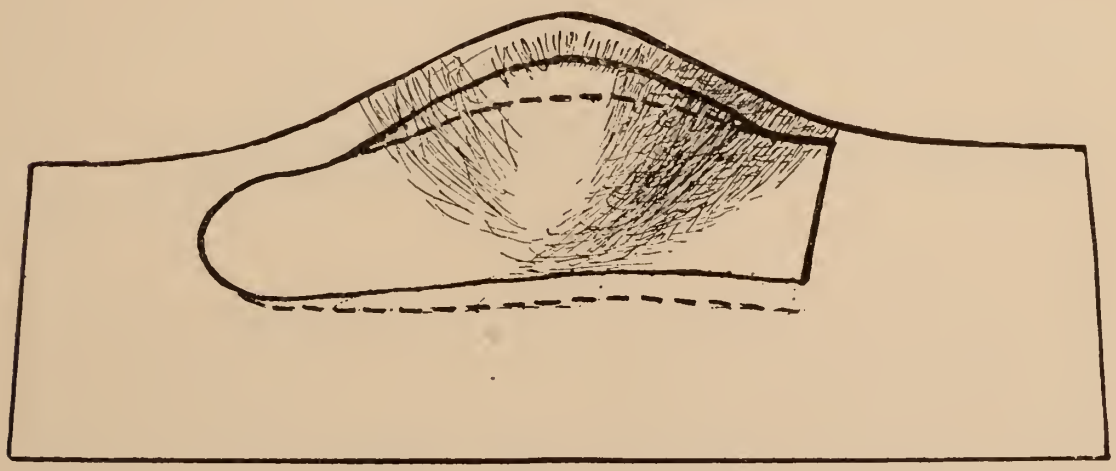
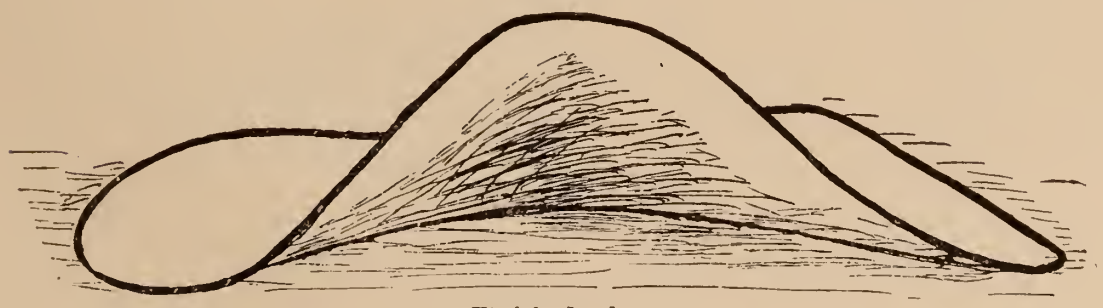


Plate marked for right foot of boy.

bent by a blow from a hammer, and laid upon the die. The upper die (Figs. 3 and 4) is placed on the top of that, and by a few strokes

FIG. 3.

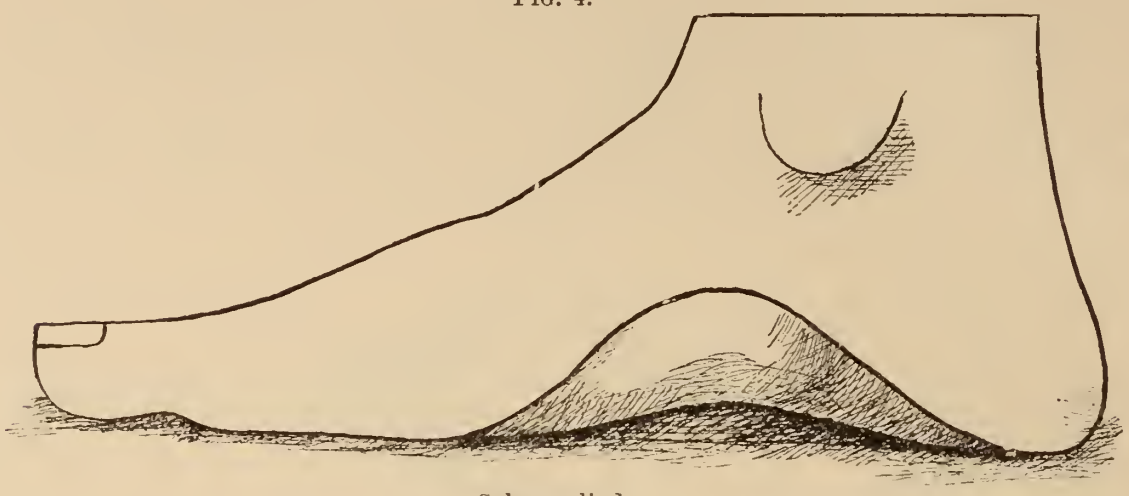


Finished sole.

with a five-pound hammer the metal is made to assume the arched-shape desired (Fig. 5). If the Whitman braces are to be made the steel should be cut wider across the middle at the curved part. The plate thus stamped can be used for a right or left foot, large or small, but there is less waste by cutting them rights and lefts at the begin-

ning.[1] The soles that I now show have been made in this way. To fit one the patient stands on it so that the arch of the foot is pressed upward as far as is bearable. If the arch be low or the foot is small,

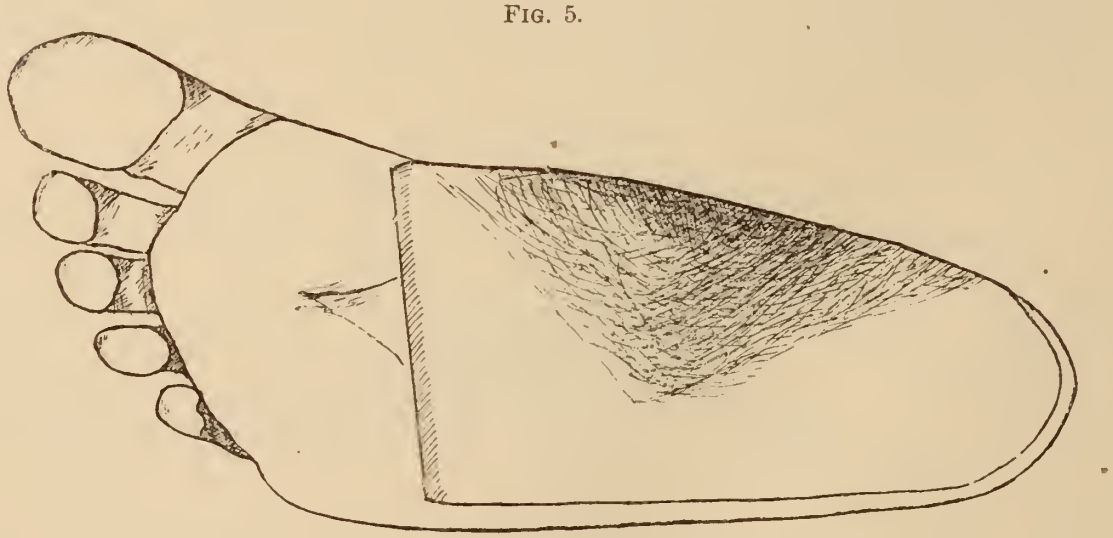
FIG. 4.



Sole applied.

the conical surface will go but a short distance under it. If the arch is roomy it will go deeper. The contour of the back and sides of the foot is, by means of the end of a file or other hard tool, scratched in a dotted line on the plate, and marks are made to indi-

FIG. 5.



Sole applied.

cate how far forward the support is to extend. This should be just posterior to the heads of the metatarsal bones, so that when the

[1] It will afford me much pleasure to have dies cast or blanks made in the hospital shop for anyone wishing to use this method.

weight is borne on the front of the foot the edge of the plate is not pressed on. For the ordinary soles this outline must be corrected by making the sole considerably narrower, especially in front, on account of the shoe; and in a small foot, when the steel inclines away from the inner side, by extending it in that direction, so as to have metal enough to be bent up against the foot. To make these corrections another contour is taken on cardboard or paper and then trimmed to fit the sole of the shoe at the front, outer side, and back, and wide enough at the arch to come well up on the inner side of the foot. The outline of this pattern is marked on the plate at the proper place, which is determined by the first or dotted line. Fig. 1 shows the marks for the left foot of large man, and Fig. 2 those of the right foot of a boy. It is a common error to make the sole too wide. The cutting can be done with a pair of tinsmith's shears about twelve inches long. Unless the shoe be a very snug fit the finished sole may be worn inside the one the patient is then using, and, what is convenient, it can be changed from shoe to shoe. The curved line representing the inner edge of the arch of the plate should be located just below the scaphoid and the head of the astragalus. Having cut the sole the desired size and smoothed the edge by means of a file or emery cloth, some modifications of shape are necessary. The flat portion at the back should be bent so as to slope from the middle of the arch slightly downward, and the front end should also receive a downward curve extending backward for three-quarters of an inch to an inch. It is very necessary that this edge be directed away from the foot. The curved inner edge or flange of the plate also requires careful treatment. By hammering it over the edge of an anvil and following the curve around it may be inclined either inward or outward. It should be nearly vertical as the patient stands on the plate. If it project outward, there is danger of cutting the shoe, and support is taken away from the foot. If it inclines inward, painful pressure will be made on the foot. The sole is now applied and the shoe put on. It is frequently found that the edge of the plate can be felt projecting against the leather of the shoe at the outer side in front and on the inner side of the arch. This shows that the plate is too broad, and to remedy it a strip is cut from the outer side. Should this not permit the edge of the steel arch to be held well against the inner side of the foot, the inner

edge of the plate may be bent a little more. Should the steel arch be too high under the sole it may be reduced by a hammer or by squeezing it in a vise. But it is to be borne in mind that here is the place at which pressure is to be made, and, if the discomfort produced is only slight, it is better to have the patient endure it for a few days in the hope that as the muscles resume their functions the foot will yield. By questioning the patient and examining the outside of the shoe, any modifications needed are readily determined, and can frequently be made by a single blow with a hammer or a twist with the hooks in less time than it takes to tell it. The shoe, preferably a laced one, should be firm enough to keep the foot well on the plate and not let it slide off. By building up the sole and heel on the inner side, after the method of Thomas, the weight is transferred, in part, to the outer side, and, if the lateral deviation of the ankle be marked, it may be better corrected in this way. Fig. 3 shows a finished left sole and Figs. 4 and 5 a right sole in position.

This description applies to the sole so long in common use, and the name of whose inventor I do not know. The flat-foot brace of Dr. Whitman[1] may be readily cut from the same plates and applied in a few minutes.

The sole, having been made apparently to fit, should be worn for a few days to ascertain whether, because of discomfort or failure to relieve existing pain, further modification is necessary. During this time it is well to have it wiped dry two or three times daily and oiled with kerosene to prevent rusting. A satisfactory shape having been secured, it must be covered. Leather, paints of all kinds, Japanning, nickel-plating, and galvanizing have all proven useless against perspiration, which sooner or later rusts the soles through. A layer of rubber plaster and over it one of thin leather will last quite a while, but this also eventually succumbs. In December, 1890, I took one to a surgical instrument factory and had it covered with hard-rubber, vulcanized on. I was not then aware of this having been done. The result, though slightly clumsy, answered the purpose. Since that time the workmen have acquired more skill, and now the soles are beautifully covered; and if the rubber covering is not worn through by a nail in the shoe or cracked by a sudden

[1] Transactions of the American Orthopedic Association, 1895, vol. viii.

strain, such as could be produced by jumping, it will last indefinitely. Hard rubber can be put on by any manufacturer of that material. The edge of the plate should be first thinned, and the material applied should be about twenty gauge.

The objects of the steel-sole should be clearly understood. It is not, theoretically, applicable to a foot rigid in a deformed position. Such a one usually requires "breaking up" under an anæsthetic. In several cases, however, when the patient was unable or unwilling to lay by for this preliminary treatment, I have been both surprised and gratified to find that the foot, though quite flat and stiff, yielded to the plate, and soon much relief was afforded. These were cases in which pain was a prominent element, and the rigidity appeared to be due to muscular resistance more on that account than to adhesions. The arched sole-plate is to be used simply as a support to hold the bones in their proper bearings both when the muscles are acting upon them and when they are at rest. Criticism has been made that it supplants muscular activity and leads to loss of power. There is a broad conservative principle which enters into almost every orthopedic condition, and which has never, to my knowledge, been fully recognized or formulated. It is that muscular activity is diminished when it is injurious to the parts upon which the muscles act. This principle is exemplified in the pseudo-paralysis of rickets and in the rigidity and atrophy of joint-disease. And flat-foot, where motion between bones in abnormal relation to each other would be very injurious, is no exception. Inasmuch as a properly fitted support restores and maintains the normal bearings of the bones, it directly permits motion and tends to muscular development. And when this is sufficient to raise the heel the foot is lifted from the plate, which then, of course, cannot interfere with motion. It has also been objected that the arch of the plate tends to stretch upward the supporting structures of the foot, and so relax them. The fact is that the tendon of the flexor longus pollicis muscle, the principal bow-string, is itself pulled up by the action of the flexor longus digitorum, and the plantar structures of a normal foot are never stretched straight across the arch. But the most conclusive proof that the steel-sole does not diminish the natural support is that after awhile the hollow foot will be found to have drawn itself away from the plate, and this can, in most cases, be dispensed with.

This is assuming that the muscles have become developed so as to maintain, when at rest, a sufficient degree of tonicity or "passive contraction." To attain this, the ultimate end, it is necessary that any disability at the front end of the foot, such as ingrowing nail, bunion, hallux-valgus and hammer-toe, which render it incapable of bearing the body-weight and affording a base for muscular action, be remedied, that the muscles be capable of sufficient exercise, and that there be no rheumatism or gout to prevent the movements of the joint surfaces against each other, or of the tendons in their sheaths.

Finally, when from paralysis, age, or other permanent conditions the muscles are incapable of resuming their normal functions, the arched steel-plate may be worn indefinitely, and will be found to afford great relief and assistance.

SOME APPARATUS FOR THE TREATMENT OF POTT'S DISEASE.

By JOHN C. SCHAPPS, M.D.,
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The controlling principle in the treatment of Pott's disease is rest, or relief from pressure and motion. Posture, fixation, traction, leverage are the means employed to secure it and to prevent deformity.

Fig. 1.

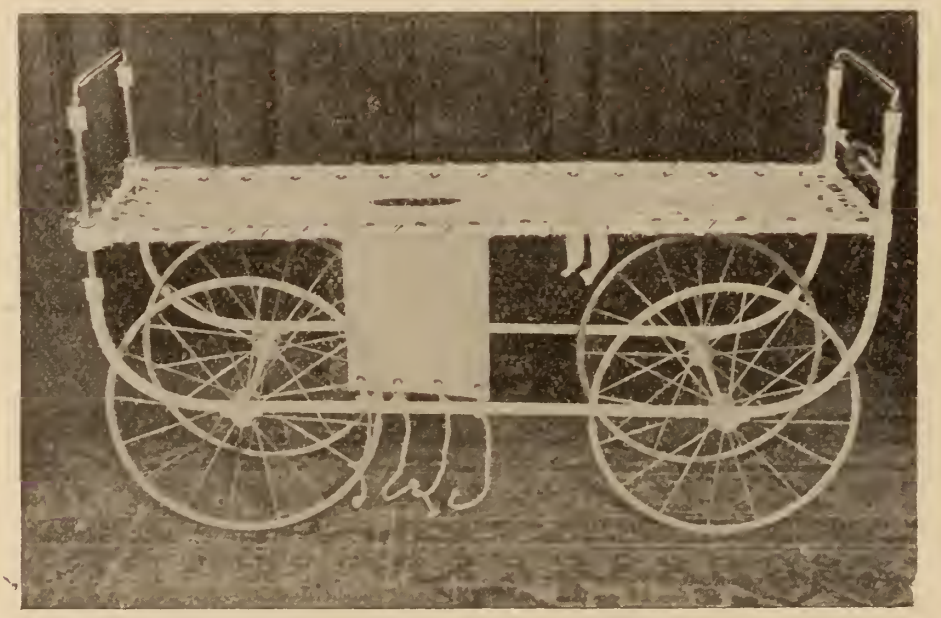
Four-foot cot.

The completeness of the rest must be proportionate to the activity of the disease. But, though Nature does not demand at the same time rest and work, the old bugbear, fear of confinement (or of lack of

exercise), which has been responsible for a vast amount of deformity, suffering, and death, itself dies hard. It is well that those of us who, in the treatment of Pott's disease, have made use of prolonged recumbency upon a surface fitted to the patient, and with both pressure and traction, should testify, on all proper occasions, that it is beneficial and not harmful—not even uncomfortable. On a wheel-cot recumbent patients can enjoy the air and sunlight and have their world greatly enlarged while submitting to the best possible conditions of repair (Fig. 1).

This cot (Fig. 1) is the result of successive modifications of the wooden one presented at the meeting of this Association held in New York in 1892, and of the folding iron cot shown in 1893. The

FIG. 2.

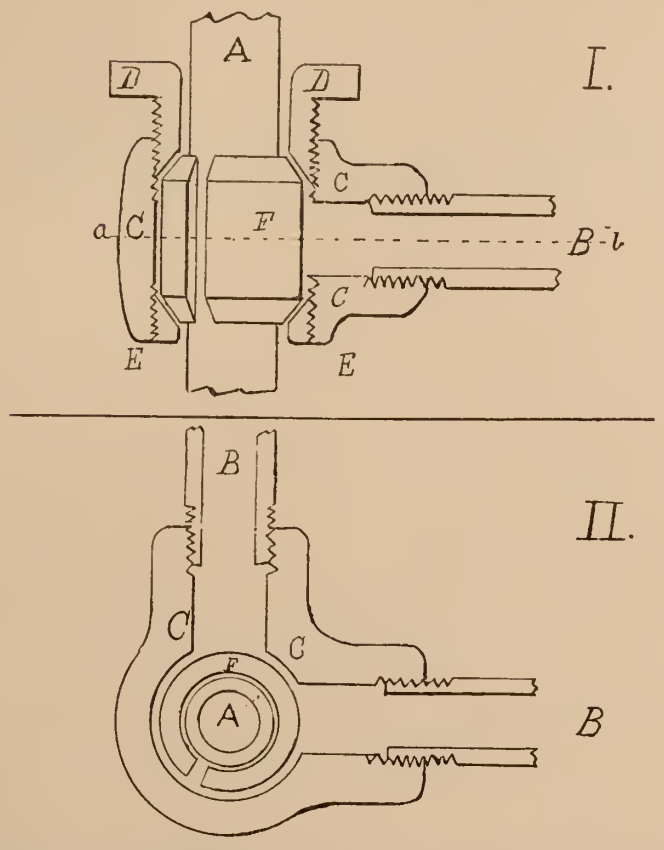


Four-foot cot.

changes were made with a view to simplicity and compactness. It consists of an iron stretcher, carrying a tightly laced canvas, and supported upon rubber-tired wheels in such a manner as to permit any required inclination. Fig. 2 shows the construction of the working parts. It is provided at the head end with a pulley. In the canvas is a narrow oval opening for the purpose of defecation and urination. In a cot four feet long—a common size for children—it is six inches by two inches and a half, and its centre is located three-fifths distant from the head of the canvas. It is closed by a

flap underneath. In planning cots for adults, I find that the opening must be made nearer the head, and it is then a safer rule to make each canvas according to the patient. There is also a line of

FIG. 3.



Showing the construction of the working parts of a four-foot cot.

I. Side view. *A*, upright three-eighth-inch brass pipe. *B*, side of stretcher, three-eighth-inch iron pipe. *C*, corner casting. *D*, iron bushing, three-quarter-inch by three-eighth-inch, inner thread reamed off inside: lower inner edge bevelled at twenty degrees; upper edge rounded. *E*, bevelled ring made from a similar bushing, screwed in, cut off, and fastened by a pin. *F*, split bevelled collar of hard rubber. As *D* is screwed down the collar is closed on the upright, and the frame is held at any desired inclination.

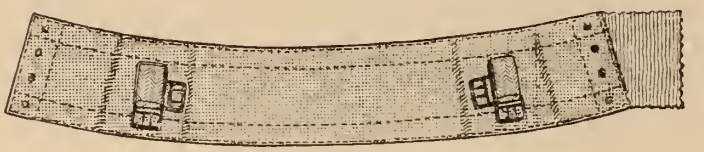
II. Horizontal section through *a b*. The references are the same. The wickets at each end of the cot are made of eighth-inch brass pipe. The vertical parts slide into the uprights and are secured at any level by a construction like the preceding. The top of the three-eighth-inch pipe is bevelled to take the place of the ring *E*. A three-eighth-inch coupling, three-eighth-inch by one-eighth-inch bushing, and a hard-rubber bevelled and split collar complete the fastening. The rest of the cot is put together by ordinary pipe fittings, and the axles are screwed into simple castings. The sizes of pipe are for a four-foot cot three-eighth-inch; for five foot, half-inch; and for six-foot, three-quarter-inch or inch.

loops on each side, near the upper end, through which pass shoulder-straps. The arrangement of pads and straps and the use of the cot have been much simplified.

To prepare a cot for a patient, he is placed upon it so that the anus is at the upper end of the opening, and marks are made on the

canvas by means of which the situation of the diseased part of the spine can be determined. He is then removed. Pads from one to two inches thick of boiler-felt are laid upon the canvas so as to make a surface conforming to the patient's back. In cervical cases it is particularly necessary that the hollow under the neck be filled.

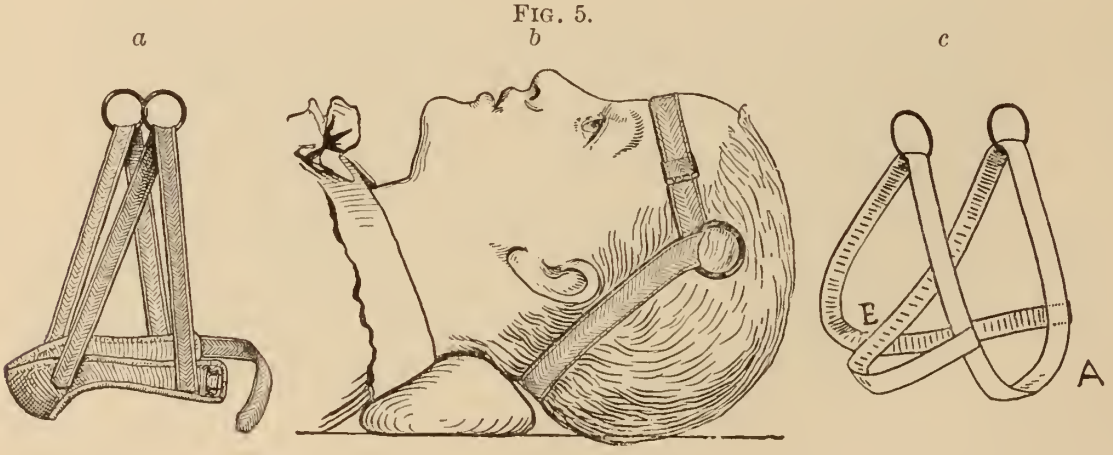
FIG. 4.



Pelvic belt.

When there is a dorsal or lumbar kyphos a block of padding as broad as the back, long enough to extend from the neck to the buttocks, and having a small slit to receive the tip of the bony prominence, is used. The upper and lower edges of the pad are thinned by cutting to different lengths the layers of which it is composed, and the edges of the slit are trimmed a little. If there is a pro-

FIG. 5.

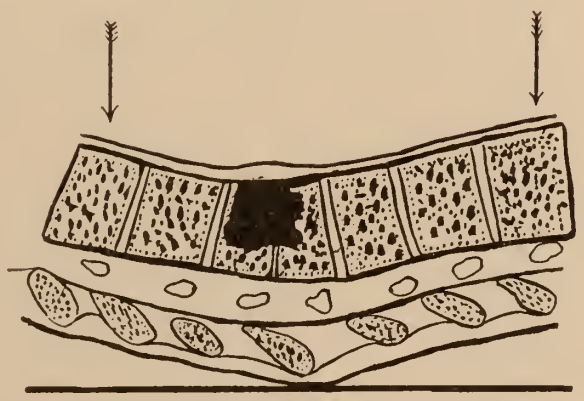


Head-slings. *a*. Sayre's. *b*. One made of a single piece of web and a buckle and two rings. A strap may be passed from ring to ring under the chin. *c*. Sling made of piece of web and two rings. The bight *A* is passed under the chin and the cross *B* under the occiput. Steele uses a four-tailed bandage. Two of the tails pass up in front of the ears, and two backward to cross under the occiput, as in *c*. (TRANSACTIONS OF THE AMERICAN ORTHOPEDIC ASSOCIATION, 1895.)

nounced lumbar hollow an additional pad is put across under the large one. A folded sheet is placed over the pads from the head of the stretcher to just below the upper end of the opening. This must be wide enough to cover the pads and narrow enough not to cover the loops. A second sheet is placed from the lower edge of the first

to the foot of the canvas. This will be more frequently changed. The patient is tied on. By feeling the lower side of the canvas it may be determined what changes are necessary in order that the entire back be supported. When this is accomplished, web straps are passed through the proper loops under the shoulder and buckled either crosswise over the chest or around the shoulders. The pelvis is secured by a curved canvas belt (Fig. 4), from which straps are buckled around the sides of the stretcher. A pillow is placed under the thighs and legs, which are secured by a piece of stout muslin pinned around them and the stretcher. Traction may be made by a head-sling (Fig. 5) and weight attached to a cord passing over the pulley, or the head-sling may be fastened from the two upper corners

FIG. 6.



The force of gravity, exerted as shown by the arrows, tends to separate the bodies at the site of disease.

of the frame, after the method of Dr. Steele.[1] The stretcher is sloped for counter-traction, or straps from the pelvic belt to the foot of the stretcher may be used for the purpose.

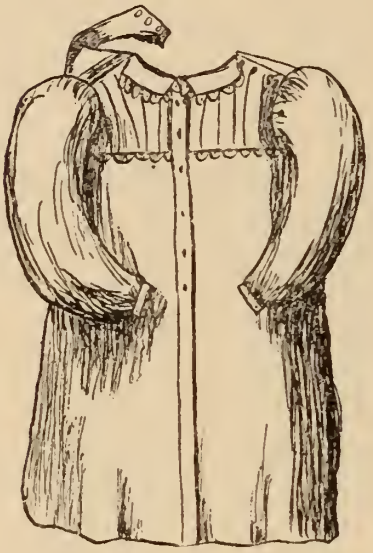
The pressure-straps constitute a most important feature. They are buckled around the sides of the stretcher and pass under the canvas at the diseased part of the spine. The amount of pressure can be thus accurately adjusted. The parts above and below by their weight not only cause backward leverage, but, as the spine is resting on the spinous processes and the centre of motion is behind the bodies, actual traction on the bodies is secured (Fig. 6). This is confirmed by the experiments of Dr. Lovett,[2] presented at the last

[1] Medical Fortnightly, St. Louis, February 1, 1891.

[2] TRANSACTIONS OF THE AMERICAN ORTHOPEDIC ASSOCIATION, 1895.

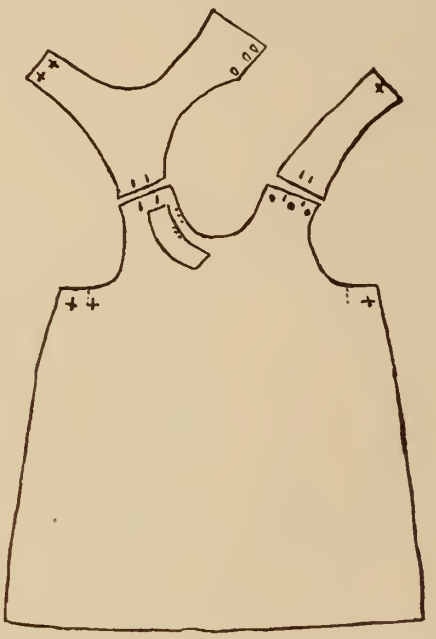
meeting of the Association, in which he shows that patients are longer when recumbent. A mark is made on the canvas at the level of the patient's head, to indicate his position. It is necessary that this should be always the same, in order that the diseased part be kept on the pressure-straps. The degree of pressure that can be borne is determined by the appearance of the skin over the part. As a rule, I do not tighten the straps until after a week or more, when under the pressure of weight a shallow trough, which fits the back and affords good fixation, is formed. The patient is dressed in a garment without a back (Figs. 7 and 8).[1] In cervical cases it

FIG. 7.



A garment without a back, for a recumbent patient.

FIG. 8.



Pattern.

is is better to pin it to the sheet on each side of the neck than to pass the collar behind. Once comfortably fitted to the canvas, the patient should be moved as seldom as possible. A slight turning between two persons, one taking the head and shoulders and the other the pelvis and legs, will give ample access to the spine. Alcohol and powder should be applied twice daily, and the skin watched for pressure-marks. Such cases, even though painless, should be handled with great care, and the relations of the diseased parts changed as little as possible. For adults, cots are mounted on two

[1] Ibid., and American Medico-Surgical Bulletin, December 15, 1895.

large wheels and two small ones, which turn on ball bearings like castors (Fig. 9), and for those children who cannot afford a wheel-cot I have the canvas stretched on a frame with short legs that can be easily lifted about (Fig. 10). To give it a slope, the supports at the foot are shorter than those at the head. The object of having the canvas suspended by its edges, in both cot and frame, is to prevent change in position of the diseased parts of the spine in raising the patient from and replacing him upon a bed.[1]

FIG. 9.

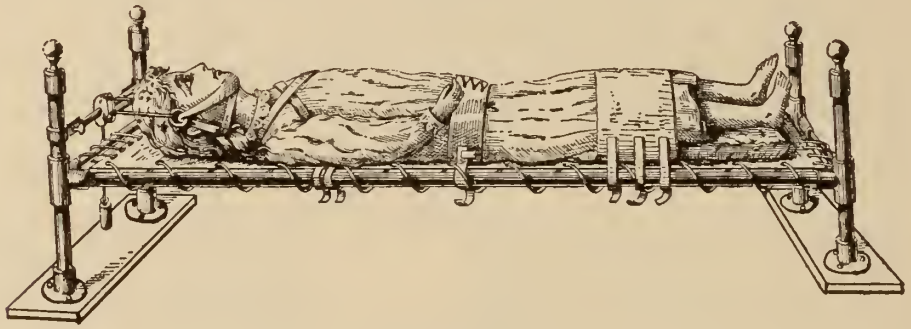
Six-foot cot.

The upright position is in all cases sooner or later adopted, and a clear conception of the condition of the spine and the possibilities and principles of mechanical support in this position are then essential. The weight of the parts above is by no means all that the diseased bone has to bear. There is also that of the parts which,

[1] The canvases are made by Messrs. John Boyle & Co., 199 to 207 Fulton Street, New York. The cots, frame, or any other apparatus described in this paper, will be furnished by the Orthopedic Department of St. Mary's General Hospital, Brooklyn. Exact dimensions must be given.

though situated below, are suspended from above. The viscera of the abdomen make downward traction on the spine at a much higher level than their own. The upper extremities are, by means of muscles extending upward from the clavicles and scapulæ, suspended from the head and cervical vertebræ. The thorax, its contents, and the abdominal muscles attached to it are also, to some extent, suspended. The diseased spine is subject also to muscular action exerted between the parts above and those below. By reason of the forward projection of the face, chest, and pelvis, much of this force is applied in a deforming manner, and at a great leverage. It is exposed, also, to constant jar and to strain from the voluntary mus-

FIG. 10.



Four-foot cot.

cular efforts concerned in equilibration and in the ordinary and necessary motions of either extremity. In addition, there is the great pressure from reflex muscular spasm or Nature's automatic splintage. And the energy required to hold the spine rigid and the lower limbs in a continuous state of elastic tension to break shock, besides reducing spinal pressure, is exhausting, and lowers the local and general recuperative powers of the patient.

Not only are the adverse conditions of the spine itself enormously increased, but the mechanical possibilities of treatment appear very inadequate. Apparatus cannot be applied as are splints to a broken limb. We must act on the spine from a considerable distance. The object sought is to fix the diseased part of the spine, or keep it forward in its relation to the parts above and below, and to counteract the deforming forces mentioned. Those portions of the body surface that are capable of transmitting support are limited. Backward pressure can be exerted on the forehead, sometimes slightly on the

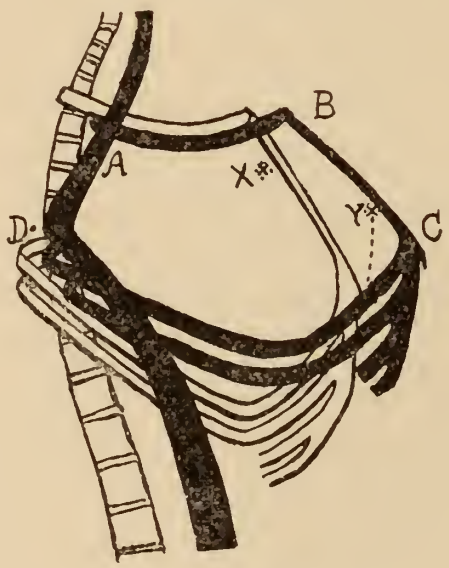
chin, on the front of the chest, and a small area around the anterior superior iliac spines. Vertical support or counter-traction may be had from the crest of the ilium, the gluteal muscles, and the posterior surface of the sacrum, when, as is not the case in a child, these parts are sufficiently developed. From this as a base, upward pressure can be exerted on the front and back edges of the axillæ, on the chin and back part of the head, and against the under side of a markedly projecting kyphos. It is not only futile, but a decided injury, to make pressure on other parts, and particularly to interfere with the respiratory movements of the chest and abdomen. For a yielding abdomen cannot transmit the force applied, and it is possible that by limiting normal respiratory motion we may divert its force to the weak place in the spine; and abdominal distention and movement tend to diminish instrumental pressure upon parts where most needed. According to Holden, the respiratory movements of a rib take place, principally, by rotation around an antero-posterior axis drawn between its ends. The greater the curvature the greater the respiratory capacity. In inspiration, most children will be observed to expand the lower chest laterally more than anteriorly. All can breathe in that way. This movement need not be interfered with for spinal support. Indeed, by directly backward pressure and avoiding lateral pressure, the normal curvature and lateral motion of the ribs are conserved. On the other hand, if this rib motion be restricted by deformity or apparatus, or by both, and by abdominal pressure what respiratory movement remains be obstructed, the interference is considerable; and in a patient with a tuberculous disease any interference with respiration is a most serious consideration. The evils of circumferential constriction of the trunk are familiar to every student of elementary physiology, and Pott's disease confers no immunity. The results to the abdominal and pelvic contents are graphically described by Dickinson in his paper on the corset.[1] The pelvic organs of little girls (and most of our patients are children) are easily displaced. Protrusions at the inguinal ring have also been observed in patients wearing constricting apparatus. Such pressure contributes nothing to the support of the spine, and its evils are vastly greater than could possibly be attributed to recumbency.

[1] The Corset: Questions of Pressure and Displacement. Robert L. Dickinson, Brooklyn. New York Medical Journal, November 5, 1887.

When the shape and area of surfaces available for spinal support, their lack of natural padding, their distance from the seat of disease, and the mobility of the intervening parts are considered, the impossibility of giving adequate mechanical protection in the upright position in any but the convalescent stage is apparent. This stage can be hastened by systematic recumbency as described. The upright position should be assumed, under careful supervision and for slowly increased periods and only in those cases in which a moderate amount of support is sufficient. All that is possible in this position can be secured without interference with the functions or position of any internal organ.

In treating cervical and upper dorsal disease in the upright position, the trunk is grasped by all available contact as a base from which to keep the head upward and backward. In disease of the mid-dorsal region, also, such traction as is possible is made on the

FIG. 11.



(Diagrammatic.) The apex of the kyphos is really lower and further back than the same point in the healthy spine; but the development of the deformity is best shown as above.

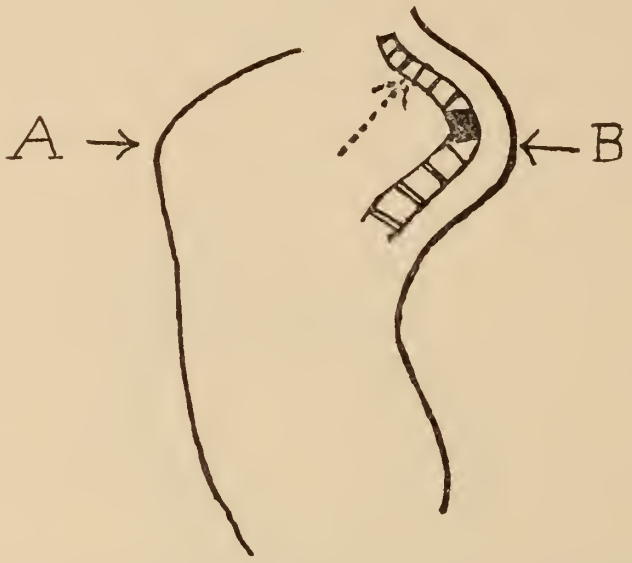
upper mass upward, and leverage is applied. That is, forward pressure is made on the diseased part and backward pressure on the spine above and below. In disease lower down, the burden to be supported is so hopelessly great and the pedestal so encroached upon that leverage—forward pressure on the kyphos and backward pressure on the parts above and below—is all that is usually attempted.

In dorsal disease we are dealing, not with the spine alone, but with the thorax of which it forms a part. Disease of the mid-dorsal region has always been regarded as the most unsatisfactory to treat. Various explanations, such as the curve of the spine and the movements of the ribs, have been offered; but it is very largely due, I believe, to the fact that although chest distortion is a conspicuous feature of the developed deformity, the parts played by the ribs and sternum in its development have not been carefully studied and antagonized. The conditions appear to be as follows: Let us take, for example, osteitis of the sixth dorsal vertebra, and for the sake of simplicity regard the bending as taking place in a circular direction around an axis passing at this level transversely through the neural canal. In Fig. 11 the normal relations of the vertebral column, upper and lower ribs, and sternum are indicated by outline, and the resulting deformity in black. The spine above the axis describes a curve, at first forward, then downward, which carries the centre of gravity of the upper mass forward. To maintain the base of the trunk (the heads of the femora) under it, the part of the spine just below the sixth dorsal vertebra is thrust forward, or, what is relatively the same, the chest is thrust backward on the lumbar spine. The lower ribs are thus tilted upward, and from their length and normally downward slope move the lower end of the sternum markedly forward. Were it not for the resistance of the sternum, the anterior end of the first rib would be displaced downward to some point, *X*, and that of the sixth upward to some point, *Y*. As it is, the former is moved forward to *B*, and as the sternum turns on this point its lower end and the connecting parts of the ribs are advanced to *C*. The bone is commonly bent by the force transmitted longitudinally through it. In the normal relation of the parts the downward pressure of weight and muscular action exerted on the head, neck, and upper chest is borne almost entirely by the spine, the arches formed by the upper ribs, sternum, and lower ribs acting as braces. But, as the line of gravity of the mass moves forward, more of the strain is transmitted from the upper dorsal vertebræ through the braces to the spine below. The back support, *A D*, is now inclined backward and the front support, *B C*, is inclined forward. The upper mass acts as a wedge and tends to spread their lower ends still further, as the legs of a stool are spread by superincumbent

weight when not tied in by the rounds. The ribs attached to the lower part of the sternum are stretched antero-posteriorly and straightened, and their relations to the vertebræ into which they are inserted are altered. The lower chest is elongated antero-posteriorly and contracted laterally. The respiratory movements of the ribs are two—upward and by lateral rotation. By tilting upward and by straightening both are greatly impaired. The sinking of the thorax on the abdomen causes diaphragmatic respiration to be also interfered with.

When the deformity is fully developed the inclination of the spine above the kyphos is so nearly horizontal that pressure to be used on the upper dorsal spine at a mechanical advantage—that is, at a right angle—would have to be applied within the chest (as indicated in

FIG. 12.

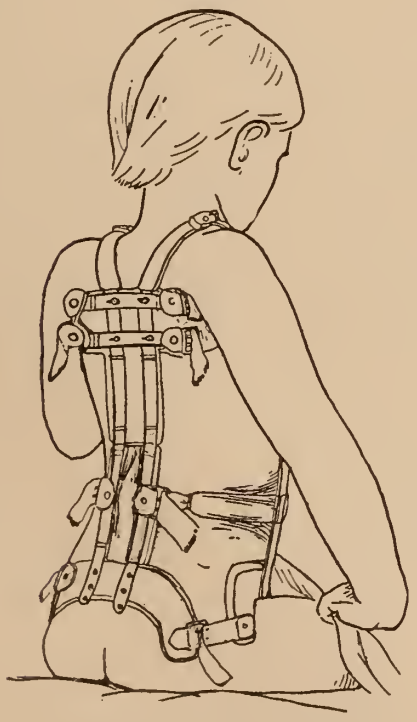


Tracing from a case of advanced dorsal disease. The arrows *A B* show how support should have been applied to prevent the deformity.

Fig. 12 by the dotted arrow) and almost vertically upward. The upper front of the chest is also so nearly horizontal that backward pressure cannot be made on it. By placing one hand on the projecting sternum and the other on the kyphos, and pressing them strongly together, I have observed in such a case that the breathing became less short and the patient expressed a feeling of relief. There was no attempt to take off the weight, I simply made sagittal compression. The outlines of this figure are reproduced from tracings of a case of marked dorsal deformity. The direction in which force must be applied to restore the parts to their normal relations, were that

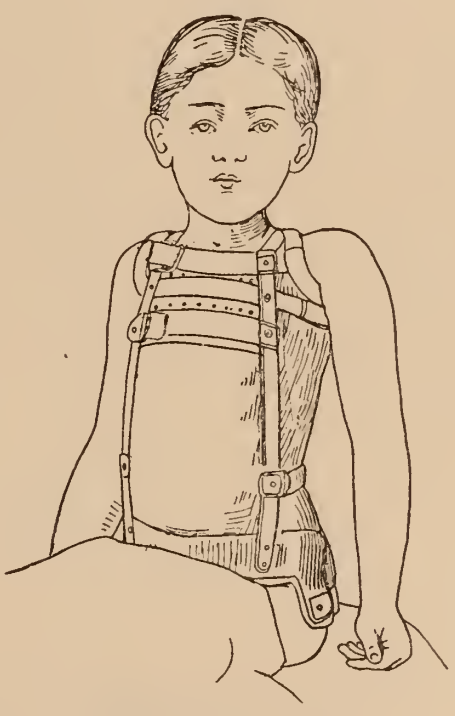
possible, shows how it must be exerted upon the normally related parts to prevent such deformity. It is essential that the pressure be applied as indicated by the arrows *A* and *B*. Referring again to Fig. 10, if pressure be confined to the upper front of the chest, the forward protrusion of the lower part is not prevented; whereas pressure on the latter exerts, through the lower ribs, a leverage on the spine below the disease, and tends to maintain the normal curvature and respiratory functions of the ribs. It also permits backward pressure at the upper part of the chest to be effectual on the upper dorsal spine. Thus, besides the general principles of support to the spine, the special indications in preventing deformity in disease of this part are antero-posterior pressure between the diseased portion and the front of the chest, especially at the lower part, and the avoidance of lateral pressure on the ribs. They must be free to curve out laterally and the viscera have space and not be compressed. Upward pressure on the free borders of the ribs also is obviously contraindicated.

FIG. 13.



A modified Taylor back brace.

FIG. 14.

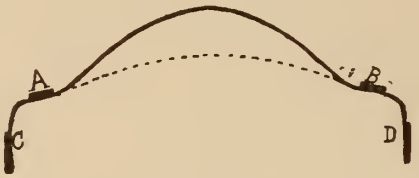


The author's front brace.

For the treatment of Pott's disease in the upright position, I use posteriorly the Taylor brace, with some slight changes (Fig. 13), and anteriorly this rigid brace (Fig. 14). Since its first application,

in 1892, it has been modified in several details. Commencing with the lower end, it presents a steel band passing across the abdomen and well around the sides of the pelvis, as low as is possible, without

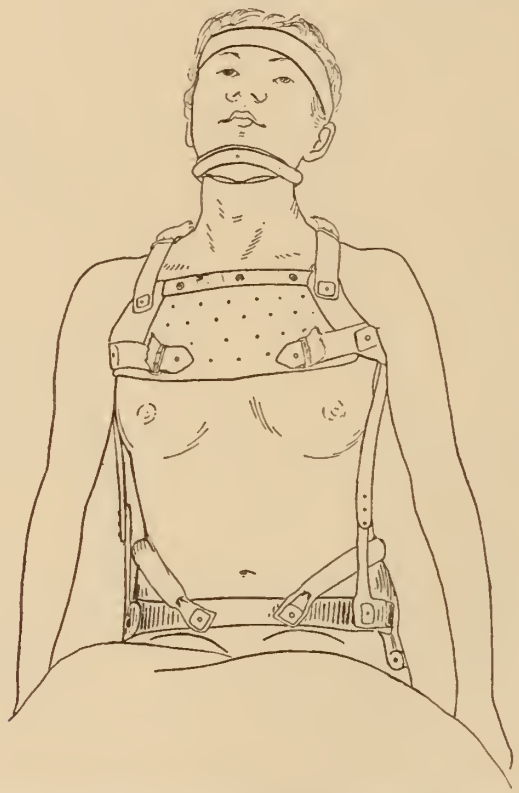
FIG 15.



Plan of pelvic band of front brace. *A*, *B*, uprights. *C*, *D*, flat pieces extending downward. The dotted line indicates the line of the abdomen when the patient is supine.

being displaced when the patient sits. The anterior superior spines are protected by thick pads of kersey and leather, and the central part of the band is arched forward so as to prevent pressure on the abdomen. When the patient is supine there should be a space of

FIG. 16.



The front brace modified for a woman or girl.

one and a half or two inches behind the band (Fig. 16). It is essential that it should bend sharply around the front edges of the ilia, and fit tightly against the sides of the pelvis for an inch or two;

otherwise the skin overlying the spinous processes will become sore. I have recently improved the brace by extending the ends at a right angle downward for one or two inches. This permits the horns of the U-shaped hip band behind to be brought lower, and so increases the length, and, consequently, the leverage of the posterior brace. This leverage is of great importance in all cases where the kyphos can be used as the fulcrum and the upper mass can be successfully grasped. By means of straps at the ends the lower front band is connected with the hip band of the posterior brace, and the pelvis may, for the purpose of vertical support, be literally clamped between the two, which nearly meet at the sides. At the location of each anterior superior spine a flat upright is riveted at right angles, or, if the abdomen is very protuberant, the uprights are directed outward from the lower band. The curving of the band permits them to be approximated above. They extend upward and inward along the abdomen and chest to the infra-clavicular spaces. At the level of the axillæ they are crossed by a flat band which passes in front of the chest and nearly through the axillæ at each end. Three holes drilled in the uprights, three-eighths or half an inch apart, will save trouble in placing the band. Or the uprights may be made in two pieces overlapping and fastened by screws, so as to be readily shortened or lengthened. The chest and pelvic bands may also be made extensible. The pelvic bar should be an inch, the others half an inch wide. No. 16 spring steel is a good material for the construction of all parts. These dimensions are for children. It will be convenient to have the separate parts covered with leather and then fitted and fastened together. In measuring, one is apt to locate the chest-band too high as well as to make the entire front brace too tall. It is very instructive to note how far the anterior chest-wall will, notwithstanding all possible pressure, descend when in the upright position. It confirms what has been stated concerning the mechanical advantages of the supine posture with reference to traction, and demonstrates the hopelessness of attempting more with vertical traction than to partly support the head and take off some of the weight of the upper extremities. At the upper ends of the uprights are straps which pass over the shoulders to buckles on the shoulder-pieces of the posterior brace, and from the ends of the chest-bands straps running backward buckle to the cross-piece. This

cross-piece extends nearly to the posterior edges of the axillæ. Placed behind the upper part of the front brace is a stiff leather perforated chest-piece, which is secured to uprights and covers the front of the thorax as far down as the ensiform cartilage. I usually have this fastened by the same rivets which fasten the chest-bar to the uprights, and support the upper and lower edges of the leather by straps and buckles from upright to upright. Near the lower ends of the uprights are padded web straps which extend over the crests of the pelvis to the buckles on the spinal uprights behind. Their utility is dependent on pelvic development. They and the hip-band of the posterior brace afford all the vertical support anatomically possible. The ends of the bar passing through the axillæ may be padded as the crutches, or from the ends of the shoulder-pieces the regular, round, padded shoulder-straps of the Taylor brace may pass through the axillæ and back to a second cross-piece placed just below the first. The perforated chest-piece can be made to fit accurately by binding it, while wet, to the chest, oiled silk being interposed. This is not usually necessary.

In high dorsal and cervical cases I prefer, for vertical support, the Taylor head-piece without the ball-and-socket joint, the slipping of which is a constant annoyance. In place of the joint I use a pivot, flattened below, to slide in a keeper fastened to the uprights. This pivot has a soft neck which can be bent easily in any direction, and is, I believe, the original device of Dr. C. F. Taylor.

Thus constructed, this combination of anterior and posterior braces constitutes a skeleton support to which parts may be added to meet the individual requirements of a peculiar case or the special views of the surgeon. Should a greater area of lateral support be required, it can be secured by a series of straps from the anterior to the posterior upright. I think, however, that in Pott's disease, lateral curvature from muscular spasm is best treated by recumbency, and lateral pressure on the chest should be avoided. Although all available space has been utilized for the application of both traction and leverage in diseases of any part of the spine, it is applicable especially to dorsal disease. When the spine above the kyphos is still nearly vertical, the backward pressure exerted at the top of the sternum and the upper ribs serves to directly repress its forward tendency, and by pressure at the lower part of the sternum and

connecting ribs the forward protrusion of the front of the chest is antagonized.

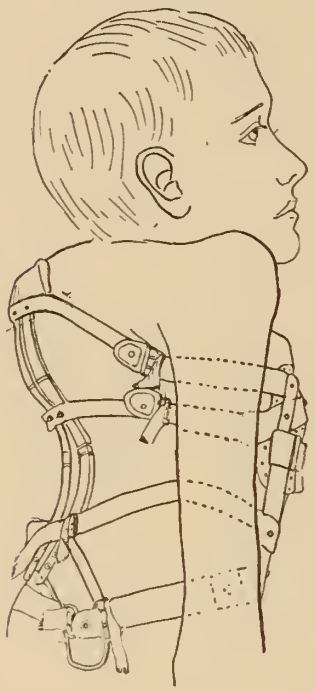
An illustration of how this apparatus may be modified to meet diverse mechanical requirements is found in its application to girls and women, and another in its use in those cases of extreme deformity of chest and spine previously described. That shown in Fig. 17 was made for a woman with high cervical disease. The area of desirable pressure being restricted by the breasts, the leather chest-piece is limited to the upper part of the thorax. Instead of placing the steel band directly across the chest, it is shortened, placed just under the clavicles, and at each end connected with a broad, curved piece of sheet steel extending through the axillæ. The uprights have been located further back, and the front ends of the padded straps, which rest on the crests of the ilia, have been transferred to the pelvic band. This attachment and the extension downward of the ends of the band, previously described, are suggestions of my colleague, Dr. J. M. Clayland. The lower edge of the leather chest-piece is secured to the steel on either side by strap and buckle. In dorsal disease the leather chest-piece is extended downward in the middle and connected with the uprights by a steel bar arching over each breast, and having at its ends straps to buckle around the uprights. It is not well to fasten the brace rigidly together in too many places because it interferes with modification.

For the case outlined in Fig. 12 the posterior uprights reach only as high as the summit of the kyphos and the front brace to just above the protuberance of the sternum (Figs. 17 and 18). No part of the apparatus passes over the shoulders, and care is taken that the ribs be not compressed laterally. Two cross-pieces were placed in the posterior brace, and thus two connections made with the anterior. Although the upper cross-piece tends downward to the axilla the pull upon its end is forward. A small pad was placed on the projection of the chest, and antero-posterior traction made between it and the dorsal projection. The prominent hips are utilized for vertical support exerted against the lower side of the kyphos. There is no pressure exerted above the kyphos, nor above the apex of the chest deformity. The leverage of a posterior brace is not applicable because grasp on the upper spine is not possible. It had sunk into the chest so far that it cannot be successfully pushed against by

pressure on the upper ribs or pulled against by traction on the head, and no adequate base for vertical traction on such a mass as that above the kyphos exists.

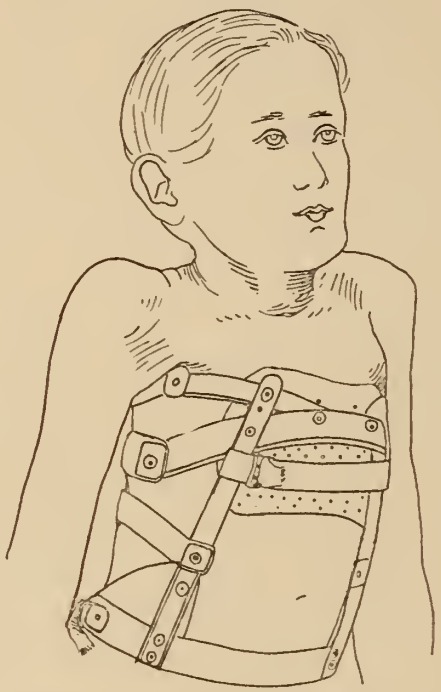
For the sake of clearness, the braces are shown as if applied to the skin. They are worn over an undershirt. It will be found convenient to cut the garment all the way down the front and put this part behind. The patient should be laid on his face twice daily, the back brace removed, and all pressure-points bathed with alcohol and water and dusted with talcum or some such powder. The brace should never be taken off or put on when the patient is upright.

FIG. 17.



The front and back brace for a case of advanced dorsal disease with chest deformity.

FIG. 18.



The front brace for a case of advanced dorsal disease with chest deformity.

To diminish the concussion of walking I use shoe heels of soft rubber. They are to be attached without nails and have the front edge bevelled to prevent catching.

The apparatus described can be made by any blacksmith, and with a pair of wrenches can be fitted and modified to meet the changing needs of a case. While some time and care must be devoted to its application, the mechanical indications once thoroughly understood, this is not so difficult as it may seem, and, when the serious nature of the disease is appreciated, the first consideration is that of ade-

quacy, and the last that of ease to the surgeon. In all orthopedic cases, particularly in Pott's disease, there is to be recognized a broad working principle that an apparatus is simply a tool to be designed and used with intelligence. The surgeon owes to the patient a careful determination of the conditions present. They may usually be met by the simple means, and the duty of meeting them is the surgeon's.

To refer a patient with tuberculous disease of the spine to an instrument-maker who knows nothing of the intrinsic nature of the case is as great a crime as to send a case of typhoid fever to an apothecary. The law protects the typhoid but not the tuberculous. When it does the latter, the sight of a patient whose diseased spine, entirely unable to bear its own strain, is further burdened by a glittering complication of steel and leather will be no more.

DISCUSSION.

Dr. Moore asked if Dr. Schapps found much advantage from the use of his apparatus in cases of severe deformity, such as was depicted in one of the photographs he presented. In that case it appeared to him that the spine had already become ankylosed.

Dr. Ketch said that the subject of anterior support in spinal bracing was a matter of much importance. He believed there were cases where the "apron" was quite sufficient, but in other cases there appeared to be a constant tendency to malformation of the anterior portion of the thorax, and where something more rigid seemed to be needed. The work of Dr. Schapps and Dr. Whitman in this direction was certainly to be commended. For years he had been accustomed to strengthen the anterior support by reinforcing the jean or apron in various ways. He agreed with Dr. Moore, that in certain cases where the disease appeared to be totally arrested, it would seem unnecessary to have the patient wear apparatus, but there was one peculiar thing, namely, that after patients had worn supports to the spine for a long time they were very loath to give them up.

THE PRESIDENT said it would be interesting if Dr. Schapps would investigate the other mechanical causes of pigeon-breast.

DR. MCKENZIE said that in the photograph of the cot presented by Dr. Schapps there appeared to be no counter-extension, and he would, therefore, like to ask if under these circumstances the traction would be efficient.

DR. KETCH asked what had been the experience of the Association regarding the manual treatment of pigeon-breast in young children.

DR. MCKENZIE said that he had not tried it in young children, but he had used it in older subjects, together with respiratory gymnastics. The improvement in anterior deformities he had found to be quite rapid.

DR. KETCH said that he had brought up this question not only because many of these cases came to us with the statement that they had been told nothing could be done for them, but because he had previously read before the Association a paper in which he had advocated this manual treatment or moulding of the chest.

DR. SCHAPPS, in closing the discussion, said that in the case referred to by Dr. Moore he had himself felt that there was not much advantage from the apparatus, but the patient had felt more comfortable with the brace. He should be on his back, but would not consent to this. The brace fulfilled the indication as far as possible in the upright position. Regarding the question of counter-traction, he would say that the cot is made to slope at any required angle so as to secure the necessary counter-traction. Where the hips were sufficiently prominent counter-traction could also be made by means of straps fastened from the pelvic belt to the foot of the frame.

THE TREATMENT OF POTT'S PARAPLEGIA, WITH REPORT OF TWO CASES.

By LeROY W. HUBBARD, M.D.,
NEW YORK.

THERE is probably nothing which produces so much terror and consternation among the parents and friends of a patient suffering from Pott's disease as the sudden development of paraplegia. They are usually prepared for deformity, though it may not have existed in the beginning, and even the formation of an abscess does not cause much anxiety. But when a child who has perhaps been running about and apparently as well as usual suddenly loses all power over the lower limbs and becomes helpless, it seems as if all hope of recovery must be abandoned. When, in addition, paralysis of the sphincters ensues and the suffering occasioned by incontinence of urine and feces follows, then, indeed, the picture is a dark one. But even in these apparently hopeless cases the prognosis is favorable, and we are able to assure the anxious friends and perhaps the patient that in the majority of cases complete restoration of power takes place, and that the number of those who are condemned to helpless invalidism is very small.

Dr. Myers, in a paper read before this Association a few years ago, reported a percentage of 55 complete recoveries in 218 cases occurring in dispensary practice, where the treatment cannot be carried out in a thorough and satisfactory manner. Taylor and Lovett, in an article in the *Medical Record*, June 19, 1896, report that in 19 cases occurring in private practice during the course of treatment there were 17 recoveries, or 89 per cent. Sayre reports 71 complete recoveries in 83 cases. Some authors have gone so far as to say that they have never seen a case which did not recover; but this is too strong a statement, as several unfortunates

can testify. Since, therefore, authorities agree that the final results in this serious complication of vertebral caries are good, the question of the length of time which will elapse before recovery takes place becomes an important one to consider. If the patient is an adult, the period of time that he must lie in bed and be unable to earn his living may be a matter of serious import. Among children this is not of so much importance; but in either case the length of time that the paralysis lasts has an important bearing upon the condition of the cord, the nutrition of the muscles, and the consequent future power.

Is it possible, therefore, by means of appropriate treatment to cut short the period of helplessness and quickly restore the function of the paralyzed muscles? How long are we justified in pursuing one definite line of treatment before changing or resorting to radical measures? It is for a consideration of these questions and a discussion of the points involved that I invite your attention to a brief review of the various methods of treatment for this form of paralysis which have been employed in the past and are still used at the present day.

It is now a little more than one hundred years since Percival Pott wrote the monograph which produced such a sensation in the medical world and associated his name forever with that disease of the spinal column which is characterized by inflammation and softening of the bodies of one or more vertebra and consequent posterior deformity. From the fact that the "palsy" which was associated with a curvature of the spine was the one symptom which called his special attention to the disease and led to his subsequent investigations, which determined its true nature was an inflammatory condition and not a dislocation, we must infer that in those days paraplegia was much more common than at present. This would naturally be the case since the progressive curvature of the spine was either not treated at all or else by methods that were irrational and harmful.

Pott, from observations of a large number of the helpless cripples, was led to the conclusion that there was a connection between the paralysis and the disease which produced the curvature of the spine. While on a visit to Worcester, Dr. Cameron, of that city, told him he had read a statement of Hippocrates that a paralysis

of the lower limbs had been cured by producing an artificial abscess on the back, and acting on the suggestion he had obtained a favorable result in a case. This statement of Dr. Cameron was confirmed by Mr. Jeffreys, a surgeon of Worcester, and Pott determined to try the method at the next opportunity.

The first case was a child, and he introduced two setons, one on each side of the kyphos. He thought the symptoms improved, but the patient died in a few weeks from an acute disease, and Pott was able by an autopsy to confirm the truth of his theories as to the nature of the disease. The second case was an adult in whom he obtained a perfect result. He introduced the method into St. Bartholomew's Hospital, where it was employed in a large number of cases. At the end of three years Pott stated that he had seen only one case, except where there had been very extensive destruction of bony tissue, that had not recovered. His plan consisted in making an eschar by means of caustic on each side of the kyphos, and then after the slough came away the sore was kept discharging by means of beans, peas, or glass beads introduced into it, and this discharge was kept up until recovery took place. He claimed that the suppuration carried off the softened bony tissue, caused incarnation and solidification. It is difficult to imagine a more disgusting and distressing plan of treatment, nor does the explanation given as to the method of cure seem rational.

Sir James Earl, who edited an edition of Pott's works after his death, and who also firmly believed in the efficacy of issues, made a plea for mechanical support to the spine, and stated that Pott kept a large proportion of his cases lying in bed, as they were too weak to sit up. Probably this absolute rest had more to do with the results than the issues. Still this method was extensively employed even in modern times until the development of the present mechanical treatment.

In 1828 Dr. J. W. Mitchell, of Philadelphia, published in the *North American Medical and Surgical Journal* an article advocating suspension for several hours daily in cases of lateral curvature and Pott's disease, and especially where paraplegia existed. The apparatus which he devised and recommended consisted of a steel rod bent in the form of the jury-mast now used with the

plaster-jacket, to which was attached a head sling. The vertical portion of this rod was attached to the back of a chair or to a child's go-cart, and by means of a rack and pinion could be raised or lowered. Very much the same apparatus was used and described by Vacher in 1768, but he made his suspension from a jacket. Dr. Mitchell in his paper gives the history of three cases only in which he had used this method, one being a case of lateral curvature, and there is no evidence that he published reports of other cases.

In 1889 his son, Dr. S. Weir Mitchell, revived the method and advocated its use very strongly in Pott's paraplegia. In a recent letter Dr. Mitchell states that he still uses and recommends the plan then proposed. Dr. Benjamin Lee is the only other author I am acquainted with who recommends the method, and it would seem to be less rational and effective than suspension in bed by means of an inclined plane and weight and pulley.

A few years ago Dr. V. P. Gibney began the use of large doses of potassium iodide, increasing them up to the extreme point of toleration. In an article which he published at that time he stated that he thought by this means he could reduce the average duration of a Pott's paraplegia to three or four months. Recently Dr. Gibney stated that while he still has faith in the iodide he could not give quite so favorable a prognosis as to the time of cure.

In 1878 Dr. C. T. Poore published an article in the *New York Medical Journal* in which he advocated the use of the actual cautery lightly applied to each side of the spine over the seat of the disease. He reports two cases, and claims that the duration of the paralysis is shortened by the use of the cautery.

In 1882 Macewen revived the old operation of opening the spinal canal. In two cases he found the cord covered by a fibrous growth, the removal of which caused the cord to pulsate, and a recovery from the paraplegia took place, though in one case it had lasted three years. Three out of four other cases died, and in one the result was negative. This operation was taken up by other surgeons, and in 1892 Lloyd (*Annals of Surgery*, vol. xvi.) was able to report 75 cases. In these 75 cases there were 29 deaths, many of them occurring within a short time after the operation, and 20 out of the 29 showed no improvement in the paraplegic

symptoms before death. Seven others who survived the operation were unimproved, leaving 39 who were either cured or somewhat improved. Two cases where the paraplegia had lasted three years, one five years, and one six years recovered; but we are struck with the large number of operations which are done very early in the course of this complication, some within a few days, and many of the fatal cases were among this number.

In the *Revue de Orthopédie* for 1894, Dr. V. Mennard, of Merck Sur Mer, published a paper upon the operation of laminectomy, and states the reason why it fails so frequently. He believes that the common cause of the paraplegia is the formation of an abscess in the body of a vertebra, which penetrates into the spinal canal, comes in contact with the membranes, and presses upon the cord. The opening of this abscess is necessary for the relief of the pressure. He reached his conclusion from three cases on which he operated in 1891–1892. On the first he did the usual laminectomy without result. In the second operation, while doing the laminectomy, he accidentally opened the abscess in the body of the vertebra, and the patient recovered. He then did a second operation upon the first patient, going in on one side and striking the vertebral abscess. After this operation complete recovery took place. In the third case he performed this operation at once with an equally satisfactory result. His method consists in the resection of the proximal end of one or more ribs at the seat of greatest deformity, and then opening the body of the vertebra by means of a trocar, evacuating the abscess. He claims that the operation is no more difficult than the other, that it is less dangerous to life, and that the integrity of the spinal column is less disturbed.

Of course the number of cases is too small to base any conclusions upon, but the operation appears to be a rational one. With a view of determining the methods of treatment employed in this complication by American orthopedic surgeons, I sent to every member of this Association a circular asking for information. Thirty-four were kind enough to send replies to the questions, which embraced the following points:

1. The use of mechanical support.
2. The question of absolute recumbency.
3. The use of external applications, drugs, etc.

4. Suspension.
5. Operation—the time and character of cases.
6. Observations in regard to results.

I desire here to thank those who took the trouble to write out the answers and send them to me. Twenty-three advocate and use habitually some form of mechanical support in the treatment of paraplegia. Eight employ no support, two apply it in some cases, and one did not answer the question. Twenty-nine stated that they insist upon absolute recumbency until there is some return of power and an absence of exaggerated reflexes, etc. Three do not require recumbency, and the answers of two were very indefinite. Six use suspension, either by the usual apparatus or in the manner advocated by Dr. Mitchell; eight favor extension and counter-extension applied in bed or on a frame; the answers of the others were indefinite. In regard to drugs, applications, etc., nine employ iodide of potassium in large doses, increasing to point of toleration; four have used it but found no benefit from it; one gives it when he suspects a syphilitic origin. The cautery is used by three, and other forms of counter-irritation by two. Only five of the thirty-four have ever operated. Sixteen advise operation in certain cases, while the rest do not think it advisable or necessary.

The reasons for operating and the periods at which the operation should be performed vary greatly. Three advise the operation after one year, one after six months, one after eighteen months, one after eight months or one year, one after nine months or one year, and one does not state the period. One thinks the operation is indicated when there is danger of a transverse myelitis; another makes incontinence of urine and feces a positive indication for immediate operation. The other indications are the assurance that a foreign body is pressing on the cord, the formation of an acute angle rapidly developed, and the neurological conditions. The reports in regard to results were too few and indefinite to allow of tabulation. The longest period in which the paraplegia existed with finally complete recovery without operation was sixteen years, partial recovery ten years and seven years. In one case it lasted three years, and in several from one to two years with complete recovery.

A rational plan of treatment in any disease should be based upon the pathology and etiology. Elliott, in a paper published in the

Transactions of the International Medical Congress for 1887, after a careful consideration of this question based upon a large number of examinations of Pott's disease suffering from paraplegia, draws the following conclusions:

1. The common cause of paraplegia is mechanical compression, and very few cases are due to a true myelitis.

2. The mechanical compression may cause only interference with the circulation and consequent blood-supply. These are the cases which recover rapidly after support is applied.

3. Compression from the formation of abscess-cavities in the bodies of the vertebra and the bulging forward of the dura and anterior ligaments which have become thickened.

The plan of treatment adopted by the majority of American orthopedic surgeons seems to be founded upon a reasonable basis. From the foregoing answers it is immediate, thorough, and efficient mechanical support to the spine and to the head, if the disease is located above the middle dorsal region, and absolute recumbency until motion returns to the paralyzed limbs, accompanied by general tonic and hygienic treatment. Statistics taken from many observers show that this plan, if followed carefully, will result in the absolute and complete cure of nearly every case, and in the majority in a short time; that it should be kept up for many months, if necessary; and that operative interference will be rarely required and should only be employed when a long and thorough trial of mechanical means has failed. As it has been my fortune to treat comparatively recently two cases of paraplegia presenting some unusual features, I have included the reports in this paper.

Report of Two Cases of Complete Paraplegia with Pott's Disease. The first case, F. R., eleven years of age, residing in Poughkeepsie, N. Y., was brought to the New York Orthopedic Dispensary and Hospital on May 24, 1892. The following history was obtained from the parents: Four years previous to the above date he was run over by a wagon, but was not thought to be seriously injured at the time. Several months subsequent to the accident a slight projection of the spine between the shoulder blades was noticed, which was soon followed by a swelling on one side of the deformity. At the local hospital this was diagnosed as an

abscess, and it was opened. The diagnosis was confirmed by a discharge of pus which continued for some time, but finally healed, and the sinus healed. No mechanical treatment directed toward the support of the spine or head was employed, and since that time the boy had been going about without any suffering. Three months previous to coming to the dispensary he showed weakness of the lower limbs, and soon the loss of power was complete. Examination showed a quite prominent kyphos involving the seventh cervical and the three upper dorsal vertebra. Paralysis of motion in the lower limbs was complete and absolute, only a very slight modification of sensation. There was extreme rigidity of all the muscles and greatly exaggerated patella reflexes and ankle-clonus. The urine dribbled away constantly.

On June 7th a Taylor spinal support with chin-piece was applied. He was sent home with instructions to keep him in a position of absolute recumbency. These instructions were faithfully obeyed, and when I saw him four weeks after the brace was applied he was able to retain his urine and void it naturally. On September 9th, three months after treatment, he could move the toes and draw the legs up slightly, and the reflexes were not so exaggerated. The history is now one of rapid improvement and increased power, so that in February, 1893, he could walk with the aid of crutches. These were discarded in April, and he has been walking about ever since, going to school and taking a moderate amount of exercise. The brace is still worn, or was when I saw him last. The deformity increased somewhat, although the paralysis disappeared.

The second case, Katie M., was admitted to one of the charitable institutions of New York City November 11, 1893. She seemed in good health, and was passed by the examining physician. In the early part of February, 1894, she suddenly fell to the floor and was unable to move her legs. She was put in bed, and I was asked to see the case. Finding a paraplegia of the spastic type, with exaggerated reflexes and ankle-clonus, I examined the spine and discovered a small kyphos involving the seventh cervical and first and second dorsal vertebra. She also had very little control over bladder or rectum. The Taylor brace with chin-piece was applied and recumbency advised. She was also put on large doses

of potassium iodide. The instructions in regard to absolute recumbency were not strictly followed, but very soon after the application of the support she gained control of the sphincters. For a year there was scarcely any improvement in the paralysis, then she began to move the toes and draw up the legs, and the ankle-clonus disappeared, though the exaggerated patella reflex remained and is still greater than normal. In May, 1895, she was able to use the limbs a little, and the increase of power was very rapid, so that in September she began to attend school, and has remained well ever since. The deformity increased considerably while she was under treatment.

DISCUSSION.

Dr. C. C. Foster said that he thought there was not sufficient discrimination between the different cases of paralysis. The kind which he most dreaded was the sudden, severe paralysis coming from fracture of the atlas in a case of cervical disease. He had reported two such cases, one of which had proved quickly fatal. The ordinary paralysis, coming on quite gradually, was almost sure to recover, whereas the suddenly developed kind was apt to prove fatal.

Dr. Ketch said that he thought Dr. Foster's cases were beyond the limits of the paper. Quite recently he had seen two cases of cervical Pott's disease with paralysis affecting the arms only. In one of these cases the diagnosis was made of transverse myelitis by a prominent neurologist in New York City, but there was a marked kyphosis, and the paralysis could be distinctly traced to the compression myelitis of the cord. His personal experience did not show a natural tendency to recovery from the paraplegia in the high regions, where the arms were affected. Recovery was not apt to be so quick and so favorable as where the paralysis affected the lower extremity.

Dr. Hubbard said that in the answers sent him no mention was made of what was considered to be the average duration of Pott's

paraplegia occurring during the regular treatment. He would like very much to have information on this point.

Dr. Weigel said that it had been his misfortune to see more cases of Pott's paraplegia among adults than among children, and it had also been his misfortune to have very few cases recover. He had at the present time under treatment a young man of seventeen, who had been paraplegic and spastic since last August. He had been treated by recumbency and traction with very marked improvement in the spastic symptoms, but with no evidence of return of power up to the present time. In adult cases the prognosis was evidently relatively more unfavorable. He had based his expression of opinion to Dr. Hubbard more particularly upon the experience with an adult who had had very little external deformity. At the autopsy it was found that the destruction of the bodies of three vertebræ was enormous, and that there was an abscess sac dissecting down nearly the whole length of the spinal column. Notwithstanding this, there had been no external evidence of suppuration. The patient had been kept in the recumbent position. Such a case might be considered a favorable one for laminectomy, yet he felt that if the slight support remaining had been removed by operation the patient would have died suddenly. He did not think any one could give even an approximate idea regarding the average duration of Pott's paraplegia.

Dr. Ridlon asked whether Dr. Hubbard's reference to Pott's paper was from the original paper or from a later publication. He had a typewritten copy of the only original copy that he had ever seen of Pott's original paper. The remarks of the reader of this paper led him to think that it contained several ideas which he had not seen in Pott's original paper. He had understood the author to say that even the cases in which the sphincters were involved were hopeful cases. His experience was quite the reverse of this. Some years ago he had reported the case of a child in whom there was paraplegia affecting both arms and legs, and which recovered very rapidly. It was the only case which he had had under his own care where the arms had been affected. He recalled a dispensary case, however, in which both arms and legs had been affected, and which did not run a very satisfactory course.

Dr. Hubbard, in closing the discussion, said that he had consulted what was supposed to be the original edition containing Pott's paper. His prognosis regarding the cases of incontinence had been based upon the two cases coming under his personal observation, both of which had done well, and also upon information received from others regarding recovery in this class of cases. In Dr. Young's recent work on orthopedic surgery it was stated that incontinence of urine did not exist except when the lumbar enlargement was involved, yet in his own two cases the disease was located in the upper dorsal and cervical regions.

A CASE OF OSTEITIS OF THE HEAD OF THE FEMUR.

By W. R. TOWNSEND, M.D,
NEW YORK.

Male, aged eleven years; first came to the out-patient department of the Hospital for the Ruptured and Crippled on July 27, 1895. Diagnosis was made of right hip-disease.

Parents living; two aunts died of diphtheria. Patient is one of four children. The others are well. One child died of diphtheria. The child has had scarlet fever, pertussis, and rubeola. Scarlet fever was followed by nephritis. Present disease began about two years ago without known cause. Child limped, complained of no pain, and has had no night-cries. Was treated with blisters to hip. After a few months he was apparently all right. About one month ago he began having pain in the right thigh, between the knee and the hip, but not in the joint. Mother has noticed that for two or three months he has walked with the thigh flexed. The boy is well nourished; the leg is flexed, abducted, and rotated outward.

The comparative measurements are as follows: From the anterior superior spine to the internal malleolus, right, $27\frac{3}{4}$; left, $28\frac{1}{4}$. From the umbilicus to the internal malleolus, right, $30\frac{1}{4}$; left, $30\frac{1}{4}$. Right thigh five inches down, 11; left, $12\frac{3}{4}$. Right knee, 10; left, $10\frac{1}{4}$. Right calf, $8\frac{1}{2}$; left, 9. Angle of greatest extension of hip, right, 130°; left, almost perfect. Has 10° passive motion in right hip.

The child was admitted to the Hospital for Ruptured and Crippled August 15, 1895.

September 12th. For the last three days has been running a temperature from 103° to 106°. There is considerable pain about the joint, but no sign of abscess. A few days ago Dr. Weir was called, but was unable to make a diagnosis. Miliary tuberculosis or typhoid fever was suspected.

28*th*. Diagnosis of typhoid fever was made by Drs. Janeway and Smith.

October 21*st*. Typhoid fever ran an uneventful course, but after a few days of nearly normal temperature it began to rise, and Dr. Ripley, who was called, thought that the last rise of temperature was probably due to a tubercular lesion and not an infection from typhoid.

FIG. 1.

Articular surface.

November 13*th*. The boy is still in bed, much emaciated, temperature sometimes reaches 104°. There is much pain about the joint. It is very tender, and a small abscess has developed just below Poupart's ligament.

December 7*th*. A small amount of pus is aspirated.

February 22, 1896. The boy is able to get about, wearing an Annin brace. The hip is very painful, and there is considerable induration about the joint.

March 28*th*. There is still a slight discharge from the sinus. An abscess of the outer part of the thigh has appeared.

Comparative measurements: Right, 28, 31; left, $28\frac{1}{4}$, $31\frac{1}{2}$.

April 11*th*. Two ounces of pus aspirated from the second abscess.

May 19*th*. Under ether Dr. Gibney excised the head and neck. The abscess-cavity was curetted and packed. The head was in two parts, as is shown in the specimen, the separation having occurred

FIG. 2.

Femoral surface.

about the epiphyseal line. The neck and portion of the head adjacent to it were apparently sound, and there was no chance for this large sequestrum, composed of the articular surface, to be discharged, as the opening leading into the joint was very small, which shows the necessity of an excision in this particular case.

July 29*th*. The boy is in fair condition. He has two freely discharging sinuses. With a probe, denuded bone is easily detected. The angle of greatest extension is 165°, and there is 15° motion. The hip is rather tender and painful. The leg is in good position, and the boy wears a polyclinic brace.

A CASE OF CLUB-HAND TREATED BY OPERATION.

By CHARLES E. THOMSON, M.D.,
SCRANTON, PA.

Teresa O., aged seventeen years, German. *Family history.* Father and mother are living and well. They were married in Germany about twenty-seven years ago. Shortly after being married the mother says she saw the picture on a show-bill of a man without arms; it did not frighten her, but she remarked to a friend that it was not good. Nine months after marriage she gave birth to a child with double club-feet and without arms or forearms; the hands, which were perfectly formed, were attached to the shoulders. It died shortly after birth. Her second child was perfectly formed also the third; both are alive and well. The fourth was perfectly developed, but stillborn. The fifth was the patient to be subsequently described. The sixth was like the first, without arms or forearms, and with double club-feet, hands perfectly formed and attached to shoulders; it was stillborn. Several more healthy children completed the family.

Personal history. Patient is a healthy girl of seventeen years, well developed except in forearms, where deformities noted were complete absence of both radii, marked bowing of ulnæ in flexion and pronation and irreducible displacement of carpal bones toward radial side of forearm, giving marked prominence to lower end of ulnæ. On attempting to correct deformities tense bands could be felt quite superficially, which were apparently the tendons of the flexor carpi radialis and supinator longus. The first operation on left forearm was on June 12, 1895, and consisted:

1. In subcutaneous tenotomies of tense, fibrous bands.

2. A free incision was made down to the bone about two and one-half inches from carpus; periosteum was stripped back and a double cuneiform piece of bone removed, the wedge extending

from without inward and from below upward; this allowed extension and supination of hand on forearm. The periosteum was brought together with catgut sutures, the wound closed with the same, dressed, and carefully retained in corrected position by

FIG. 1.

Photograph showing deformity before operation.

plaster-of-Paris case, extending from shoulders to tips of fingers. Patient suffered but little from operation, the highest temperature being 100°. She left the hospital on June 22d, ten days after the

operation, and at the end of six weeks union appeared quite established.

On August 20th she came to the hospital for a second operation. My intention was to do a similar operation to the one above de-

FIG. 2.

Photograph showing correction of deformity of left forearm, after operation.

scribed, at a point about two and one-half inches below the elbow-joint, to correct a bowing which still existed in that part of the bone. In her struggles, which were always extremely violent

during etherization, the ulna at the seat of the last operation was fractured. Taking advantage of this mishap, I over-corrected the deformity, forming a compensatory curve at the seat of recent frac-

FIG. 3.

Photograph showing correction of both forearms.

ture, instead of correcting, bowing higher up by cuneiform osteotomy, as I had intended. The results were extremely satisfactory. To the casual observer the forearm and hand appear perfectly straight, the muscles of the forearm, which are well developed, completely

X-Ray Photo. showing compensatory bowing of left arm as described in article.

concealing the double bowing that exists in the bone. She has perfect use of the flexors and extensors of the hand, and for months has been able to carry heavy weights, do housework, etc.

On November 18, 1895, I operated on right forearm, doing an operation somewhat similar to the first described on upper third of ulna, the difference being retention of the bones in apposition by kangaroo-tendon suture through drilled holes in either end. The wound was closed, dressed, and retained as before. She suffered a great deal more than from the first operation, but the wound healed kindly, and at the end of ten days she went home. The plaster-of-Paris case was removed at the end of six weeks, when union appeared firm.

On April 9, 1896, she came in for her last operation. Profiting by our previous experience, to prevent fracturing the arm during her anæsthetic struggles, I encased the arm and forearm in a plaster-of-Paris bandage and administered chloroform. An operation similar to the last was done on the lower third of the ulna, subcutaneous tenotomy being done for the second time on tense bands above described. Kangaroo-tendon, dressing, and plaster-of-Paris case were used as before. On the evening of the operation the patient complained of pain in the right side and chilly sensations; temperature went up to 100°; the next day it went to 104°; pulse 108; respirations 28. Examination revealed pneumonia of middle lobe on right side. It ran rather a severe course, the temperature standing at 104° for four days, when it suddenly dropped to normal, and convalescence began. Eight days after operation the dressings were removed, and a small abscess was found at the seat of the old operation, which was about two and one-half inches above the seat of the recent one. Recent wound was found completely healed, except about half an inch at the upper angle. The abscess found was quite superficial, not extending down to the bone, and healed in a few days; but notwithstanding the utmost care the upper angle of the new wound became infected and the upper half of the new cicatrix broke down, and healed only by granulation. Sinus thus formed unlike the first abscess, extending down to the bone, and now non-union was feared; but at date of writing, which is eight weeks after operation, union is quite firm and soft structure closed.

An interesting point to me is the cause of the abscess at the seat of the old wound. Was it the outcome of some infectious focus that incidentally developed at that time, or did the operation at close proximity or the infectious systemic influence of the pneumonic process produce the etiological factor in the development of the abscess?

I noticed that in the operation, where no attempt at retaining the divided ends of the bone with ligature was made, that the patient endured less pain and union appeared to be more rapid and firm.

TORTICOLLIS DUE TO ADENOID VEGETATIONS AND CHRONIC HYPERTROPHY OF THE TONSILS.

By ARTHUR J. GILLETTE, M.D.,
ST. PAUL, MINN.

All meet with cases of torticollis of an acute nature due to inflamed glands, rheumatism, traumatism, nerve-irritation, myositis, sprains, abscesses, hæmatoma, etc., which of themselves soon disappear or respond quite readily upon the relief of the local conditions.

The cases, however, which I report here belong, I believe, to that class which is known as congenital or idiopathic wry-neck, save one that is given simply to show how readily this deformity was cured by the removal of the adenoid vegetations in the retro-nasal space, and also demonstrates how, if long continued, the tonic spasm of the muscles would naturally cause a structural change in the contracted muscle which would cause a contracture.

We know the changes made in the ribs and sternum known as pigeon-breast, often due to adenoid vegetations and hypertrophied tonsils, and the typical facial changes due to this same disease.

My attention was first called to adenoid and enlarged tonsils as a factor in these cases some two years ago, when a case was referred to me with congenital wry-neck. I was unable to find any other cause. The history is as follows :

Male, aged seven years, well-nourished, bright and active; a remarkably good family history; right sterno-cleido-mastoid muscle so much contracted that the ear was within an inch of the shoulders ; marked asymmetry of the face and head. The mother stated that as soon as she began to dress the child she noticed that " its head was crooked—that is, within ten days after its birth—and that she could

not straighten it. It was not, however, so marked that a stranger would notice. She observed that the cord (sterno-mastoid) showed much plainer on one side than on the other. The accoucheur stated to me, upon inquiry, that it was a normal labor aside from the traction with forceps, and that there was no injury to the neck or abrasion of the skin. The child seemed to have no pain, and was not fretful in any way that would suggest any inflammatory irritation.

The deformity gradually increased until it was very marked. I noticed that the child was a "mouth-breather," and that his tonsils were much enlarged. I questioned her as to his breathing, and she stated that even in infancy he had always made a great noise in breathing in his sleep, and when awake never seemed able to breathe through his nose. As I could find no other cause for his condition, I thought this might account for it, and referred him to a laryngologist, and he discovered not only the abnormal hypertrophy of the tonsils, but a complete nasal stenosis, which he relieved and amputated the tonsils. When the boy returned to me there was a marked improvement in his facial expression as well as an improvement in his sleep. The mother remarked how much better he seemed to be in every respect. I then etherized him and divided the sterno-cleido-mastoid; the head was easily brought into a normal position, and rotation was perfect. As a means of holding the head in the corrected position, I employed the ordinary Sayer's jury-mast, attached to a leather corset. This he wore for several months. Within six months the face was as nearly symmetrical as is usual. He is now perfectly cured, and there is no tendency, and never has been, to the return of the deformity.

My next case was that of a baby, sixteen months old. The mother noticed when he first tried to sit up that he did not hold his head quite straight, and when he was old enough to be attracted by noise that he did not seem able to turn his head in one direction as well as in the other. She had noticed, a few weeks before bringing him to me, that when suffering from a slight cold he seemed to hold his head more crooked than at other times. The family history was good; the birth normal; the child was bright; and there was no evidence whatever of any paralytic trouble. The left sterno-cleido-mastoid was prominent and held rigid by tonic spasm; asym-

metry of face and head and slight pigeon-breast. This boy was also examined. The tonsils were not much hypertrophied, but the vault of the pharynx was filled with adenoid growths. These were removed. For a day or two the child seemed to hold its head in a more abnormal position than usual; but two weeks after, when he visited me, I felt sure I noticed an improvement both in the position of the head and the symmetry of the face. I have no doubt but that in this case it will be necessary for me to divide the contracted muscle. I say muscle, for I am unable to find any other than the sterno-cleido-mastoid involved.

My third case of this nature is not of congenital variety. The child had been under my care in infancy and early childhood for rickets, from which it made a perfect recovery. I did not see the child again until it was three years old, and was then referred to me from the medical department of the Free Dispensary as a case of wry-neck. The mother stated that some six weeks previous the child was suffering from a cold. A physician was called, and hot applications were applied to the contracted side of the neck and medicine administered internally. In fact, several physicians were called, but the child did not improve. I found no fever or constitutional symptoms of any kind; there was no vertebral trouble, adenitis, or anything to cause the contraction of the sterno-cleido-mastoid muscle. I referred it to the nose and throat department. There was, as in the other cases, the same condition of the vault of the pharynx, filled with adenoid vegetations. These were removed, and the child was referred back to me in two or three days entirely cured of the deformity.

In reading the literature upon wry-neck I notice that a large number of cases similar to the latter have derived great benefit—in fact, many of them cured—by the use of gelsemium, and I wonder if its efficacy is not due as much to its effect on this inflamed tissue controlling the inflammatory exacerbation as to its antispasmodic value.

There are several practical points upon which I was able to get the desired information from books. I wrote to Dr. J. E. Schadle, instructor in clinical laryngology of the State University of Minnesota, and who had operated on the cases reported, and the following is his reply:

St. Paul, Minn., May 12, 1896.

Dr. Gillette : In your communication of to-day the following questions are asked :

1. How early in life do adenoid vegetations at the vault of the pharynx appear ?

2. What conditions were present in the three wry-neck cases on which you operated for adenoids ?

In reply to these questions I will briefly say that heredity undoubtedly forms an important factor in the production of hypertrophied lymphoid tissue, and that in the majority of instances where the retro-nasal space is involved in the morbid process the condition is congenital. The cases referred to in your second question were well-marked examples of the disease. A boy, aged seven years, had chronic enlargement of both the faucial and the pharyngeal tonsils. Complete nasal stenosis existed, and the patient's facial expression, as well as his general appearance, indicated the evil consequences of obstructed respiration. Complete removal of the obstruction restored nose-breathing and produced a marked improvement in general health. Regarding the other two patients nothing except adenoid growths were found. The tonsils were not affected. In operating I employed the digital method on both.

The dispensary case made a rapid recovery. Two days after the post-nasal operation the wry-neck had entirely disappeared.

THREE CONGENITAL LEG AND FOOT DEFORMITIES.

By A. J. STEELE, M.D.,
ST. LOUIS.

Case I. *Congenital subluxation (anterior) of the tibia, with absence of the fibula; talipes valgus, genu valgum, webbed toes, and shortened leg.*—This deformity was found in a little girl, aged five years, at the M. P. Children's Hospital, St. Louis; admitted

Fig. 1.

January, 1891. She was well developed, and otherwise normal. Nothing in the family history to indicate heredity, though the deformity was congenital. The right leg was two inches shorter than the left, and abducted. The knee-ligaments were so lax that on

extension of the leg the head of the tibia slipped forward and projected about one-and-a-half inches, with a decided click. On flexion the relation of the bones became normal and the knee natural in appearance. No external malleolus was present, at least the fibula could not be felt, so the foot was extremely everted, producing a decided talipes valgus. The second and third toes were more than usually webbed, and a scar two-and-a-half inches long existed in the skin over the lower third of the spine of the tibia. It can be faintly seen in the cut.

I had the pleasure of showing this case to our fellow-member, Dr. Shaffer, who believed it rare, and who offered valuable suggestions in the matter of treatment.

While the case was under observation but little was accomplished toward remedying the deformities except to straighten the foot and hold it so by a plaster-of-Paris splint. The photograph was taken after it had been so twisted several times, so the valgus does not show as extreme as when first brought under observation, and yet it was present, the absent malleolus permitting it to turn out.

Before more radical measures were taken to correct the foot or render the knee useful, the case passed from under our observation.

Speaking of deformities of the foot, Walsham and Hughes say (p. 335): "In rare instances the fibula may be absent, or its lower end may be deficient or absent. In these cases the eversion (of the foot) may be extreme." And "we have not found tenotomy of much avail., the bones appearing to be fixed in the deformed position by locking against the internal malleolus. In such a case Mr. Walsham recently succeeded in restoring the foot to its normal position by removing a wedge-shaped piece of bone from the internal malleolus without opening the ankle-joint. When the foot can be rectified it must be held in the restored position by the use of a boot with double leg-irons and a valgus T-strap."

Of the partial forward dislocation of the knee present in this case, reduction could not be accomplished with the limb extended, but flexion brought the bones in normal relation. And it may be that in the way of treatment unremittent flexion for months and months would have so shortened the ligaments that ultimately slipping would not have occurred.

I find reported eight cases of complete anterior congenital luxa-

tion of the tibia, but none of partial displacement forward, so that in this particular our case is unique.

Nineteen cases are reported of absence of the fibula, with the accompanying foot eversion; and the presence of a congenital scar over the spine of the tibia at its lower third is not at all infrequent. The two following cases are in point:

Case II. *Absence of lower end of fibula, with congenital talipes valgus.*—Peter G., male infant of a few months, born with a deformity of the left leg, which was one-and-a-half inches shorter than its fellow. No portion of the fibula could be made out, and certainly

Fig. 2.

the malleolus was absent, allowing a marked eversion of the foot. The little toe was missing, and the characteristic scar was present at about the junction of the lower with the middle third of the tibia, at which point there was a slight anterior curve. One would almost suppose there had been an intra-uterine fracture with an angling forward of the bone, which had either punctured the overlying integument or caused irritation and adhesion of the intra-uterine membrane, which later was torn away, thus in either case causing a scar.

This case was more amenable to treatment than the preceding, and in time, with the aid of irons and a high shoe, a serviceable limb may be had.

No history of heredity could be obtained.

CASE III. *Congenital absence of fibula, talipes valgus; absence of two outer toes.*—A healthy female infant, born with deformed left leg and foot. A marked depression existed just above the ankle, as though a cord had constricted the leg. Above this was seen a scar one inch in length over the tibial spine. The eversion of the foot was extreme, and it could not readily be restored to normal position. The leg was shorter than its fellow, and the absence of the two outer toes indicated arrest of or interference with development. As the

FIG. 3.

fibula could not be made out in any part of its course, I concluded it was absent; the outer malleolus was missing, and thus permitted extreme foot eversion. Before much had been accomplished in the way of treatment the case passed from under my observation. The photograph shows the well foot behind the affected one, giving an indistinct outline to the part and marring the picture.

These three cases were much alike in some particulars, though differing in others; while the fibula, certainly its lower end, was apparently absent in all, yet it may be that the Röntgen ray would have shown an outer bone present, even though rudimentary.

SOME UNUSUAL CONGENITAL DEFORMITIES.

By JOHN RIDLON, M.D.,
CHICAGO.

Believing it to be the duty of a specialist to present a record of unusual cases to his associates, I beg to offer for your consideration a brief report of the following cases that have come under my observation during the past three years:

Case I. *Congenital constriction bands, etc.*—H. D., male, two-and-a-half years old, the first child of healthy parents. There is no physical defect or deformity in the family for at least three generations. The pregnancy and birth were uneventful and in all respects normal. The mother is unable to offer any suggestions as to a possible cause for the deformities.

Left hand. The index-finger was joined (webbed) to the ring-finger, and the ring-finger to the little finger from the tips nearly to the junction of the proximal and middle phalanges; and the middle finger was congenitally amputated at the end of the proximal phalanx and was pointed (conical). Otherwise the hand was normal.

Right hand. The index-finger was joined (webbed) to the ring-finger as in the other hand, and the middle finger was amputated and conical (see Fig. 3); but the little finger instead of being webbed, as in the other hand, was encircled by a constriction band between the root of the nail and the distal joint (see Fig. 3). Otherwise the hand was normal. When first seen by me all the webbed fingers on both hands had been amputated by the family physician at the end of the proximal phalanges, as shown in Figs. 3 and 4.

Left foot. A constriction band encircled the great toe. Otherwise the foot was normal.

Right foot and leg. The foot presented a moderate degree of talipes

equino-varus. This had only been treated by occasional gentle hand-stretching by the mother. Around the ankle was a constriction band (see Figs. 1 and 2), having the appearance of cicatricial tissue, and

FIG. 1.

Case. I. Showing the crease in front and to the outer side.

FIG. 2.

Case I. Showing the crease at the back and on the inner side.

about a quarter of an inch in width. This band creased the soft parts very deeply, about three-eighths of an inch at the front of the leg and about seven-eighths of an inch at the posterior and inner side. The mother reported that at birth there were no voluntary movements in this right foot, but that at the time the webbed fingers were amputated this constriction band around the ankle was incised transversely in three places, and that since that time there have been some voluntary movements in this foot, and that these have increased under rubbing and manipulations. No other deformities or peculiarities were found.

Treatment. Under the impression that there would be no difficulty in looking up the literature of the subject, I arranged to operate on the constriction band about the ankle, but I was not able to find a report of an operation upon such a case. I therefore made

two circular incisions around the leg, one above and the other below the band, and dissected it out. I found little or no subcutaneous fat beneath the band, which appeared to involve only the skin, except at the points of the three transverse incisions already referred to.

FIG. 3.

Case I. Corresponds with view shown in Fig. 1.

At these points the cicatricial tissue extended deeply; it was dissected out. The skin and superficial fat and connective tissue were then dissected up for about half an inch entirely around the leg, both above and below; these edges, bridging over the crease, were brought

together and sutured, and dressed without drainage. The result, a year later, is shown in Figs. 3 and 4.

The equino-varus was operated upon about four and a half months after the operation upon the constriction band by subcutaneous divi-

FIG. 4.

Case I. Corresponds with view shown in Fig. 2.

sion of the Achilles tendon, manual rupture of the posterior ligament of the ankle-joint, and subcutaneous division of the anterior half of the deltoid ligament.

CASE II. was one of congenital constriction bands very much like Case I., but only affecting the lower extremities. The parents of

the patient refused operation; it has been lost sight of, and my notes of the case have also disappeared.

Case III. *Congenital amputations.*—Male child, three months old when first seen. Born with both legs amputated at the knee-joints, and left arm amputated at the elbow-joint. No other con-

Fig. 5.

Case IV. Showing bow-legs.

genital deformity or defect. This was the third child of healthy and well-formed parents, and the mother knows of no congenital deformity in either her family or her husband's family. This child died in Cook County Hospital before photographs were obtained.

Case IV. *Congenital rickets.*—Congenital rickets is, in my ex-

perience, rare. Indeed, this is the only case I have ever seen. For the photographs in this case and the history I am indebted to Dr. John L. Porter, late House-Surgeon to St. Luke's Hospital, Chicago, and now assistant to the Chair of Orthopedic Surgery in the Northwestern University Medical School.

FIG. 6.

Case IV. White part of head shows membranous area.

This child was born at St. Luke's Hospital, Chicago, February 3, 1896, in the service of Dr. J. C. Hoag. Weight at birth seven pounds. The head presents a typical cranio-tabes, the entire vault from the frontal prominences to the cerebellar fossæ of the occipital bone and between the two parietal bosses being soft and membranous and without ossification. There are small centres of ossification at

each of the above-named centres. At birth the parieto-occipital, parieto-frontal, and parieto-temporal articulations overlapped. In the upper extremities there was marked enlargement at the distal epiphyses of the radii. In the lower extremities there was a marked exaggeration of the anterior and outward curves of the femora; but the most marked deformity was in the anterior and outward bowing of tibiæ and fibulæ, together with the enlargement of the distal epiphyses. The feet tended somewhat toward the equino-varus deformity. Tenderness to pressure and manipulation was noticed very early at the enlarged epiphyseal junctions, and to some degree over all bony prominences. The photographs, Figs. 5 and 6, were taken on the tenth day after birth. They do not show the bowed femora nor the anterior bowing of the shins to advantage.

The mother, aged thirty-six years, has had ordinarily good health since childhood. She has by a former husband two other children, aged fifteen and four years, both in good health and free from deformity. No history of syphilis in the mother or in either husband can be obtained. During the last pregnancy the mother has been in extremely poor circumstances, and has been at work, with poor hygienic surroundings and insufficient nourishment up to date of confinement.

Case V. *Congenital recurvated knees; knock-knees; talipes equino-varus; spina bifida, with incontinence of feces; and convergent squint.*—The child, a female, was twenty-one months old when first seen by me at the time the photographs were made. According to the mother's statement, the knees were recurvated about twenty degrees at birth, and very little passive motion at the joints was possible. Under manipulation the motion has increased. They can now be extended (recurvated) to about the degrees above mentioned, and can be flexed about ten degrees beyond the straight, as shown in Fig. 7. The patella can only be felt as a minute, hardish nodule in the tendon extending from the quadriceps femoris muscle to the tibia on either side.

The knock-knees and the talipes equino-varus, both only of moderate degree, are shown in Fig. 8.

The spina bifida was the size of a small orange and of firm consistency. The mother stated that it had been much larger prior to the operation by the family physician. The operation appears to have been simply suturing the tumor through and through. A

crease, apparently the suture line, appears on each side; one of these is seen in Fig. 7.

The incontinence of feces apparently depends upon the spina bifida. The urine is passed with unusual frequency, but there cannot be said to be real incontinence.

FIG. 7.

Case V. Shows spina bifida and full degree to which it is possible with some force to reflex the knees.

FIG. 8.

Case V. Shows knock-knees, talipes equino-varus and squint.

The convergent squint is seen in Fig. 8. It is not of marked degree, and is seen sometimes in one eye and at other times in the other. The bridge of the nose is sunken and the frontal prominences are protuberant.

The child appears mentally deficient. The parents and the other children are healthy and well formed, and the mother can offer no plausible explanation for the defects in this child.

CASE VI. *Congenital poliomyelitis anterior.*—C. S., female, aged nine years when first seen by me. The mother states that at the birth of the child the labor was very difficult and prolonged; and she believes it was a dry labor. Dr. Charles Gilman Smith was the attending physician and Dr. W. W. Jaggard the consultant. Both are now dead, and no positive record of the condition at birth can be obtained. Dr. Smith, however, advised operation on the feet. Dr. Charles Adams advised against operation, and none was done. Later, the late Dr. Mathias Roth, of London, England, prescribed elaborate and minute forms of massage, and the use of steam to induce muscular contraction. Under his direction day braces and night braces were worn. Mr. Bernard Roth has not been able to find any record of this case, although the mother is positive that he saw the case with his father. Still later, Dr. Dobie and his son, Dr. Henry Dobie, of Chester, England, advised an operation, but the advice was not taken, and Dr. Roth's treatment was continued for some years.

The child did not walk until two-and-a-half years old. The braces ordered by Dr. Roth, and made by Ernst, of London, were copied by Sharp & Smith, of Chicago, and she continued to wear them until seen by me.

At that time (March 3, 1894) both feet were held in full extension (equinus) without lateral distortion. The anterior part of the feet was broadened and the Achilles tendon attached to the inner side of the posterior border of the os calcis in each foot as it usually is in congenital talipes equino-varus; the leg muscles were shrunken, and the whole general appearance of the legs and the feet, taken with the history, led me to look upon the condition as one of ordinary congenital equino-varus and to prognosticate a development of strength in the dorsal flexors of the feet when relieved of the strain of the extended position.

On March 7, 1894, I divided the Achilles tendon subcutaneously, and had no difficulty in fully dorsal-flexing the feet. Good union of the cut tendons took place at the end of two weeks. After this the patient was allowed to walk in braces that prevented the toes from dropping beyond a right angle with the legs, and massage was given daily. At the end of a year and a half the feet remain in good position, but there is no ability on the part of the patient to dorsal-flex the feet. Had the case been one of ordinary congenital

talipes equino-varus normal strength in the dorsal-flexor muscles would ere this have developed; but from the results of treatment I can only conclude that the deformity was due to an intrauterine attack of poliomyelitis anterior.

FIG. 9.

Case VII. Dr. Thompson's case.

CASE VII. *Congenital constriction bands.*—I am indebted to Dr. Charles E. Thompson, of Scranton, Pa., for permission to publish the following case:

J. L., male, aged six years, robust and strong in every way. Father, mother, three brothers, and three sisters living, in good

health and well formed. The mother attributes the deformity to the fact that during the third month of her pregnancy she tied a cord tightly around her own finger to stop the bleeding from a cut.

At the birth of the child the following deformities were noted:

Right hand. Constriction band around the middle finger in front of the nail on the dorsum and somewhat further back on the palmar surface. (See Fig. 9.) Otherwise the hand was normal.

Left hand. All of the middle finger beyond the distal end of the proximal phalanx was absent "except a mere thread," which the mother removed. The remaining stump is shown in Fig. 9. Otherwise the hand was normal.

Right foot. Distal phalanx of great toe amputated, and two distal phalanges of second toe amputated. Third toe had no nail. Otherwise the foot was normal.

Left foot. Great toe and second toe amputated as in the right foot. The third toe considerably longer than its fellows. There was a constriction band surrounding the second phalanx; on the dorsum it approaches the first phalanx. The fourth toe was very much smaller than its fellows on either side. The fifth toe was normal, as was the foot in every other respect.

THE MOBILITY OF THE NORMAL SPINE IN RECUMBENCY.

By HERBERT J. HALL, M.D.,
MARBLEHEAD, MASS.

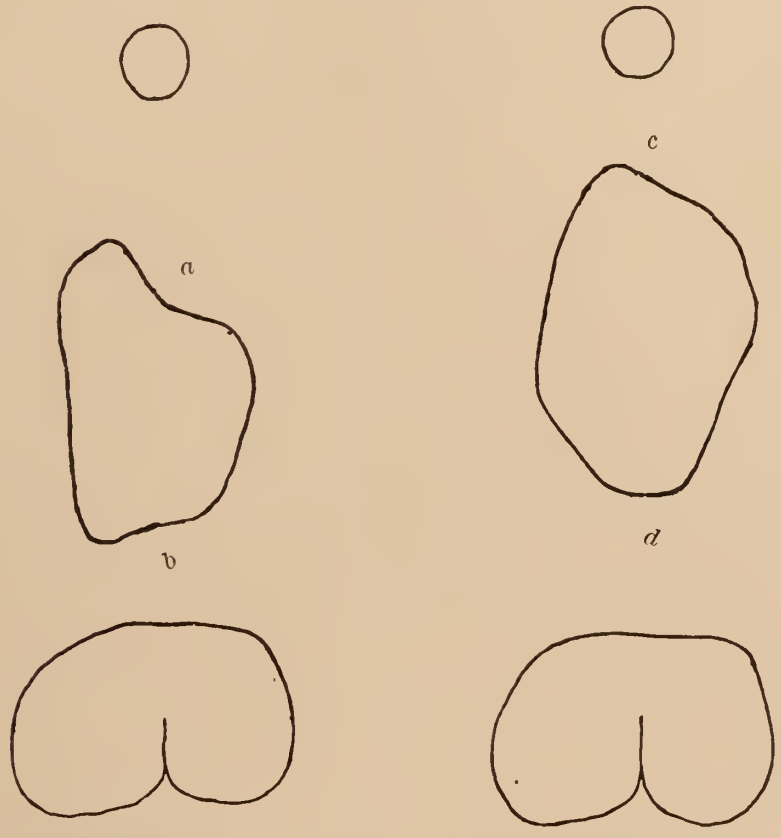
The tracings about to be described are submitted because they show graphically and with a fair degree of accuracy the amount and kind of mobility possible in the spine of a child in the dorsal decubitus. A surprisingly great mobility is demonstrated, and it is hoped that the data obtained, besides adding to our general knowledge of the spine, may emphasize the necessity for better fixation than is generally attained in the bed treatment of Pott's disease.

The spinous processes of a child with a presumably normal spine were marked and numbered on the skin, from the sixth or seventh cervical down to the last lumbar. The child thus prepared was laid supine on a table which had been especially prepared with a plate-glass top. An observer looking up from below could plainly see the marked back through the glass, as well as the occiput (which appeared as a small, dark circle) and the buttocks (flattened out and blanched by pressure). There was, of course, another area of contact across the "broad of the back;" and this will be called for convenience the dorsal plane. The concavity of the neck, although not made up entirely of cervical vertebræ, will be termed the cervical arch; and that part of the spine not in contact between the buttocks and the dorsal plane will be mentioned as the lumbar arch.

It was observed that flexion and extension of the head and thighs caused marked variations in the location of the bearing surfaces of the spine and back, and also that there was a corresponding variation in the height of the two arches or concavities, as measured from the table to the skin. Gradual and complete flexion of the head from a position of extreme extension was found, in a typical case, to

change the upper limit of the dorsal area of contact from the level of the sixth dorsal spine to the level of the first dorsal, while the lower limit remained practically unchanged. In the same case, flexion of the thighs up to ninety degrees varied the lower limit of the dorsal plane from the eleventh dorsal in extension to the second lumbar in flexion. The cervical arch, measured by calipers at about the third cervical spine, was found to be a full inch lower in flexion of the head than in extension.

FIG. 1.



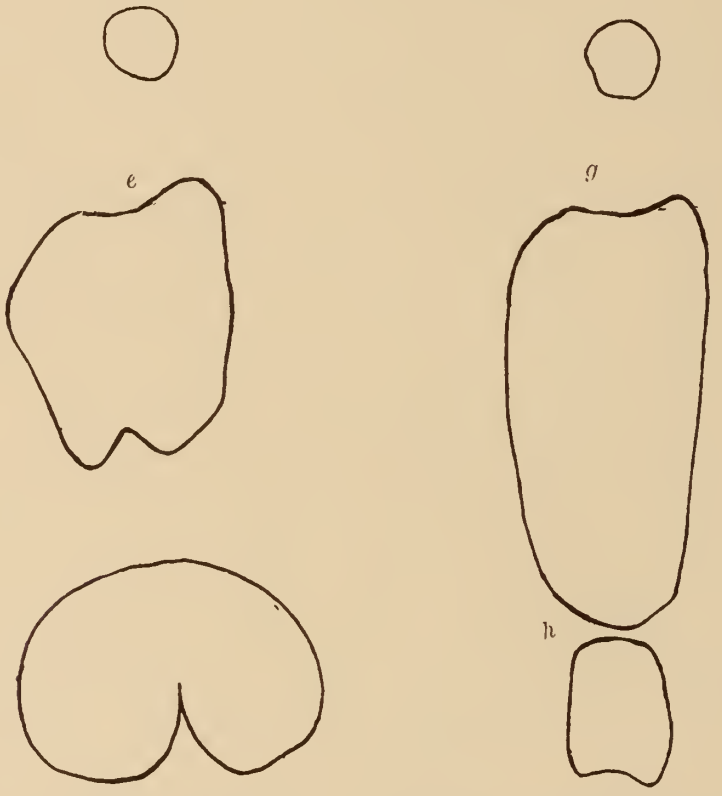
Head extended. Head flexed.
a. Sixth dorsal. *b*. Eleventh dorsal. *c*. First dorsal. *d*. Tenth dorsal.

In order to obtain an available record of a number of cases the following method was pursued: An assistant held the child's head strongly flexed on the chest, while with a special glass-marking pencil a small circle representing the occiput was traced on the under side of the glass. The irregular map-like outline of the dorsal plane was traced, and the cordate outline of the buttocks was recorded in a similar manner. The head was then sharply extended and held in that position, while, without otherwise moving the child,

fresh tracings were made representing the new areas of contact. The marks and numbers of such spinous processes as would be useful in describing the tracings were then recorded on the glass. Before erasing the tracings the lines were transferred full size to heavy paper for permanent record and reference.

A corresponding series of tracings were made of the back when the thighs were in extension and at ninety degrees flexion, the head being allowed to assume the most natural position—that is, half-way between flexion and extension. In each case caliper measurements were made of the cervical arch at about the third cervical spine. The lumbar arch was so low and so difficult of access that no accurate measurement of its height could be made.

FIG. 2.



Thighs extended. Thighs flexed.
e. Second dorsal. *f*. Eleventh dorsal. *g*. Second dorsal. *h*. Third lumbar.

The ten cases traced were children between the ages of two and ten, all convalescent from medical diseases or from surgical conditions not known to affect the spine. There was an average change of six vertebral spines in the upper limit of the dorsal plane between flexion and extension of the head, and of five spines in the lower

back between extension and ninety degrees flexion of the thighs. The cervical arch varied in height an average of three-quarters of an inch.

This, it will be seen, is equivalent to saying that flexion of the head shortens and lowers the cervical arch, while extension of the head lengthens that structure and increases its elevation. Flexion of the thighs shortens and lowers the lumbar arch. The extent of these changes will be seen in the above averages.

In several instances, including the one shown in the drawing, even the lower limit of the dorsal plane was moderately varied by extreme motion of the head, and, although no measurement was made, the height of the lumbar arch was observed to change slightly with motions of the head, while flexion of the thighs usually produced a slight involuntary extension of the head with a corresponding raising and lengthening of the cervical arch. An amusing and instructive diversion from the routine consisted in giving the child on the table some object to play with, allowing him to move his legs and arms freely about. This would be an occasion for what might be fitly termed the dance of the spine. Changes like those recorded above, and much greater variations than could be brought about by passive motions, were produced with amazing rapidity. The longitudinal and lateral play of the spine at such a time would be a revelation to one who supposes that simple recumbency means even a moderate fixation.

The drawings herewith presented are accurately reduced from the original tracings. The curious shapes observed are due to an unimportant flattening out of the muscular and cutaneous back under the weight of the child. If the eye follows the median line in the drawings the change in the length of the spinal arches will be readily appreciated.

Just what occurs in the complicated mechanism of the spine when head and thigh motions are inaugurated we shall not in this connection attempt to make out, but it is not unreasonable to suppose that marked changes in intervertebral pressure may occur, and that the whole articular spine is subject to the influence of these simple, passive motions.

A little experimentation showed that comparative fixation could be obtained by a careful support of the concavities in the cervical

and lumbar regions. When these arches were well padded up, motions of the head seemed to be disposed of in the high cervical articulations (occipito-ataloid), while thigh flexion exerted its influence no higher than the hip-joints.

If the spine is to be fixed in the bed-treatment of caries, it should be fixed, of course, in a desirable position. We may need cervical or lumbar lordosis, or we may not, as the case may be. The consideration of that question is beyond the scope of the present paper. We have learned that the spinal arches may rise and lengthen, fall and shorten to such a marked extent as to demand a careful study of the mechanism involved. Further than this it seems probable that our present rather unscientific methods of padding the spine in caries may prove very faulty in the light of future experiments in this line.

The writer wishes to thank the administration and staff of the Children's Hospital, Boston, for the use of materials and for unfailing courtesy during the collection of the data necessary for these notes.

JOINT-DISEASE IN INFANCY.

By AUGUSTUS THORNDIKE, M.D.,
BOSTON.

The limits of this paper will confine it to chronic or tubercular joint-affections. The occurrence of chronic joint-disease in infancy has been recognized for many years. All are agreed that it commences most commonly in children between the ages of three and ten. This applies to other forms of tuberculosis as well. During childhood the osseous and lymphatic systems are most commonly invaded, while the lungs are attacked less frequently than in young adult life. The peritoneum and the pia mater of children are not infrequently diseased. Acute miliary tuberculosis occurs in childhood, but it is probably less common than in older people, and, perhaps, in young infants.

Our present knowledge concerning tuberculosis in infancy—that is, in babies under two years of age—is based almost entirely upon clinical records, because autopsies on young infants are rare, and many tuberculous lesions are difficult to recognize during this period—in fact, in small babies a diagnosis is sometimes impossible. The frequency of tuberculosis as a cause of death in children has been emphasized in a recent article by Rudolph Hecker, of Munich (*Münchener med. Woch.*, May 15, 1894), in which he states that out of 1200 autopsies of children under fifteen years old tuberculosis was the cause of death in 247, or 20½ per cent.—a very high death-rate. He found more autopsies of tubercular babies during the first year of life than in any one year of childhood; the second and third years were the next most frequent; while after fifteen tuberculosis is comparatively scarce; autopsies of infants show that the lungs are almost always affected.

The question naturally arises, are tuberculous affections of the

bones and joints as prevalent at this early age as pulmonary tuberculosis? Owing to the small mortality from chronic bone and joint-disease, records of autopsies would throw little light on this point, and the answer must be sought in a clinical analysis of a number of undoubted cases of tubercular ostitis in babies. The following summary of cases, all occurring in infants under two years of age, is prepared from the clinical records of the out-patient department of the Children's Hospital, Boston, and appears to show that in the spine, hip, and knee tuberculous disease occurs a little less frequently than in older children, but it is nevertheless not a very uncommon affection. It varies somewhat from the ordinary types of childhood, but is more apt to produce a generalized infection with tubercle bacilli and death.

My thanks are due to the hospital staff, especially to Drs. Brackett and Lovett, for their courteous assistance in collecting these data from the hospital record-books. These are carefully kept, and a note is entered by the attending out-patient surgeon of each visit of every patient. 11,291 children's records have been examined, covering a period of thirteen years, from February, 1883, to April, 1896. Out of this mass only undoubted cases of spinal caries, hip-disease, and white swelling of the knee occurring under the age of two years have been selected.

There were 120 cases of spinal caries, 61 of hip-disease, and 29 of tumor albus, making 211 in all, or 1.8 per cent. of all the surgical out-patients.

The following table gives the average age when the first symptoms were noted. In a few records this was not mentioned, and they are omitted:

Age in months.	Caries of spine.	Hip-disease.	Tumor albus.
Birth to 6 months	7	5	0
7 to 12 months	13	10	11
13 to 18 "	34	17	8
19 to 24 "	61	29	10
	115	61	29

These figures show that in spinal and hip-disease but few cases begin within the first six months of life, while the frequency of occurrence increases rapidly with the age; in fact, there appear

to be twice as many in each successive half-year, so that about one-half of all infantile cases begin in the last six months, just before the children complete their second year. No case of tumor albus was found under six months old; it occurs with about equal frequency in the successive half-years. Judging from this small collection of cases, it appears that tuberculosis of the spine, hip, and knee is far less common in early infancy, but becomes comparatively frequent as the babies develop into little children at the termination of their second year.

Spinal Caries. It is surprising to see how much more common spinal caries is than hip-disease at this period of life. The close resemblance in infancy between rickets in the spine and spinal disease *may* be accountable for this; but I have endeavored, in examining the records, *not* to count any case in which there was a suspicion of error in the diagnosis.

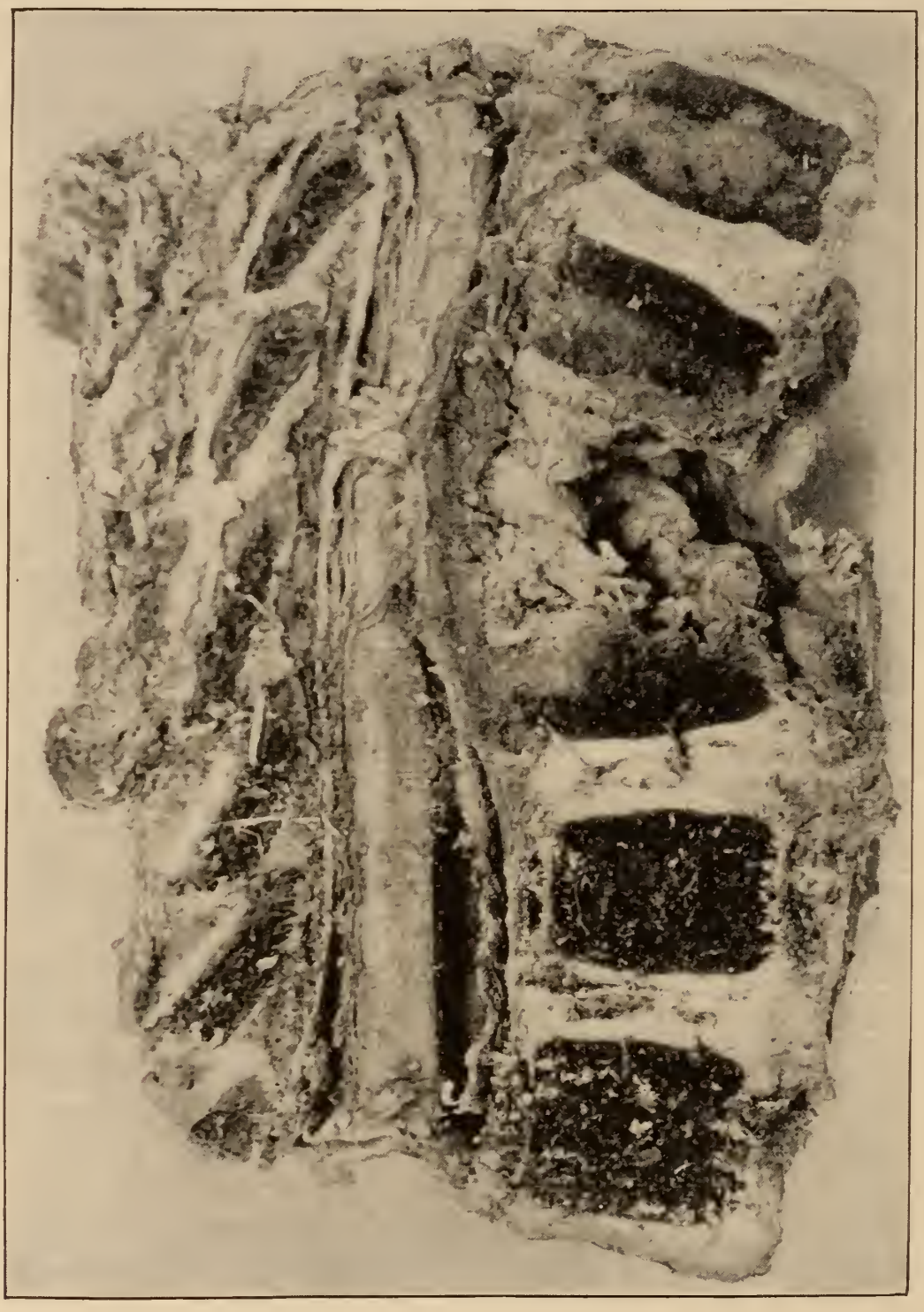
The cases were located in the following parts of the spine: 11 cervical, 3 cervico-dorsal, 12 high dorsal, 36 mid-dorsal, 20 low dorsal, 8 merely localized in the dorsal region, 8 dorso-lumbar, and 14 lumbar.

Besides these there were six in which the location was not stated, and one occurred in two parts of the same spine—that is, mid-dorsal and low lumbar—and one involved the sacrum as well as the last lumbar vertebra. It is particularly interesting to note the large number of cases, eighty-seven (almost three-quarters of all) in which the disease was in the dorsal region. Most of them resulted in considerable deformity.

The number of cases within the first year of life were eighteen; thirty-four were between one year and eighteen months, and sixty-one over eighteen months old. Seven began within the first six months of life; one was six months old; one five months old; one four months old; one two months old; one was one week old; and two were said to have been born so.

Traumatic influences were the alleged cause in one-sixth of the cases. The onset was usually described as slow or gradual—that is, in seventy-six, or three-fifths of all. Only once was the deformity noticed without symptoms. In fifteen the onset was described as a sudden change in the infant's behavior. Eighty-one babies had pain; in thirty the baby would cry out whenever

it was lifted or moved; in nineteen the pain was considered abdominal. Night-cries were present in sixty-four cases, and were frequent and severe in twenty-five. Labored breathing was noted



in six, and considerable cough in eight. The characteristic military gait was observed in fifty-two, and several walked guardedly, holding on to chairs and tables, while six leaned over to one side—that

is to say, when the babies could walk they showed the typical spinal gait.

Thirty-three, or over one-quarter of the cases, were complicated by abscesses; there were four cervical, six lumbar, one gluteal (first on one side and then on the other), and twenty-one ilio-psoas, three of these being double. Paralysis occurred in seventeen, or one case in seven. In four there was complete paraplegia, and in two of them the rectum and bladder were involved; of the latter one recovered, the other died recently of general and pulmonary tuberculosis.

In the six cases that died, death was attributed in two to tubercular meningitis, in three to general tuberculosis, and in one to bronchitis. In addition to these, one case was lost sight of with double broncho-pneumonia and three with phthisis. The number of cases is too small to attempt to establish any definite death-rate, but between 4 and 8 per cent. of these little ones died either of some form of tuberculosis or some affection which in young babies it is at times impossible to differentiate clinically from pulmonary tuberculosis.

This photograph illustrates the extensive bone-destruction in a case of mid-dorsal caries. She died recently in my service at the West End Infant Hospital, aged twenty-three months. The autopsy by Dr. A. H. Wentworth showed both lungs to contain extensive areas of atelectasis and an infiltration of gray miliary tubercles; both pleuræ were thickly coated with a gelatinous material, which, when scraped away disclosed numerous gray areas the size of millet-seeds. Tubercles were also found in the liver, the kidneys, and the surface of the spleen, and one was seen through the visceral layer of the pericardium. There were cheesy bronchial glands. An abscess two inches in diameter bulged from the bodies of the sixth and seventh dorsal vertebræ, behind the heart, containing cheesy and puriform material and leading to eroded bone. Several vertebræ were removed *en masse*, sectioned and photographed by Dr. Edward H. Nichols, who reports:

"Examination of the spine shows areas of tubercular infiltration, with central necrosis surrounded by epithelioid and giant cells, about which are small round cells. Perfectly characteristic tuberculosis of bone."

In spite of extensive destruction of the vertebral bodies, the

external deformity was very slight. Six months before death she first came as an out-patient, and a provisional diagnosis of incipient spinal caries was made. It is an instructive example of systemic infection with tuberculosis.

Hip-disease. There were sixty-one cases in which the diagnosis of hip-disease was made. In thirty-six the right hip was affected, in twenty-five the left. A history of traumatism was obtained from the parents in sixteen. One case began in the second month; one in the fourth; one in the fifth; and one in the sixth month, while one began with a cold abscess within the *first week of life.* Ten occurred between the age of six months and one year. Seventeen were over a year and under eighteen months, and twenty-nine between that age and the two-year limit. The frequency, therefore, increased with the age in the same ratio as in the spinal cases.

As many of the children between the age of one and two years are running about, lameness was frequently the only cause for which the child was brought to the clinic, and the onset was usually gradual and slow. Acute pain at the very beginning was, however, noticed in fourteen, almost one-quarter of the cases. Night-cries were noted in thirty-two (one-half), and were frequent and severe in twenty-three of the cases. The hip was held partly flexed in forty-four, and in six was abducted as well; motion was very much restricted by muscular spasm in fifteen cases, while the hip was rigidly held in thirty-one at the time of the first visit. One or more abscesses occurred in nineteen, or almost one-third of the cases. The resulting atrophy and shortening was very considerable in nine, and was unfortunately not recorded in many others at their last visit to the hospital.

There is a type of benign or ephemeral hip-disease occurring in these young babies quite frequently, coming on with great sensitiveness, flexion, and fixation, due to muscular spasm, and gradually subsiding under rest, and resulting in a cure within three or four months. There were eight cases of this sort. Others belonged to a malignant type, characterized by remissions, with fresh exacerbations of acute symptoms, resulting finally in considerable atrophy and shortening, and sometimes in permanent malpositions.

Some cases are still more malignant. Six are known to be dead

(10 per cent.). Three of these died of general tuberculosis, two of tubercular meningitis, and one of cause unknown. Taken in connection with the fatal results occurring in spinal disease, it would seem that infantile cases are more apt to result in death, and that general disseminated tuberculosis, tubercular meningitis, and pulmonary tuberculosis are the usual factors in producing the fatal result.

Tumor Albus. Only twenty-nine cases of infantile tumor albus were discovered among the records. As in hip- and spinal-disease, the older babies were more commonly affected. None occurred in the first six months of life; there was one at seven months; one at eight; one at nine; one at ten; two at eleven; and five at twelve months—that is, eleven cases which began during the first year. Eight were over a year and less than eighteen months old, and ten cases just under two years. The right knee was affected eleven times; the left eighteen. Traumatic influences were noted by the parents in only three. The gradual occurrence of lameness and swelling of the knee was observed in all children who walked. One case followed immediately after an attack of measles; another after an attack of grippe; and one "began as an abscess of the knee." There was pain in almost every one of them; severe and constant pain at night in only three; night-cries were noted six times. The knee was held rigidly semiflexed in fifteen, and motion was most limited in almost every case. In two it was at first but slightly limited, and was painful only in extreme flexion and extension. One or more abscesses occurred in seven, one-quarter of the whole number of cases. None of the cases died or were very ill when discharged.

As in hip-disease, seven, or one-quarter of the whole, were of the benign, ephemeral type; that is to say, they recovered in three or four months with almost perfect restoration of motion and usefulness of the knee, but with a slight amount of bony enlargement. Most of the others remained at the clinic from one to seven years, and recovered with a straight leg and from 10° to 90° of motion. Only one was excised.

SUMMARY.

Spinal caries was twice as common as hip-disease and four times as common as tumor albus. It occurred at any age from birth up;

the dorsal region was affected in almost three-quarters of the cases. There was frequently much pain. Abscesses were common, over one-quarter of the cases had them. Paralysis occurred in one-seventh, and was sometimes a grave symptom. The death-rate was high, and pulmonary tuberculosis or a general dissemination of the tubercular inflammation hastened the fatal end.

In hip-disease the onset was usually gradual and painless, but was acutely painful in one-quarter of the cases. Night-cries occurred in one-half; abscess in almost one-third. Atrophy and shortening were usually considerable, and fatal results were not uncommon. The death-rate is high. Six cases died out of the sixty-one; general tuberculosis and tubercular meningitis are to be dreaded in infantile hip-disease.

Tumor albus in infancy was far less common than the other two affections, of a milder type, and more amenable to treatment.

Tubercular joint-disease in *infancy*, therefore, seems to present the following distinctions: It is frequently attended by great pain and acute symptoms, and is more apt to result in general dissemination or infection with tubercle bacilli than in older children. On the other hand, babies with typical symptoms and signs of joint-disease sometimes get well in a short time—three or four months—with but slight impairment of motion and some bony enlargement, and they are classed as ephemeral cases. Their etiology is doubtful, but they are included in the series because of the similarity of the early symptoms and the persistence of slight amount of bony enlargement and slight impairment of motion. Again, many of the cases run a typical course, differing only in a long duration and great amount of bone-destruction. Is it not proper to assume that in the young, soft, vascular, rapidly-growing bone of infancy tubercular foci are less likely to remain confined to small circumscribed areas, and that hand-in-hand with larger areas of destructive tubercular inflammation of bone comes an increased risk of general infection?

PRACTICAL INFERENCES FROM CLINICAL OBSERVATIONS IN LATERAL CURVATURE OF THE SPINE.

By A. B. JUDSON, M.D.,
NEW YORK.

In a majority of the patients affected with lateral curvature of the spine it becomes evident at the very first examination that the curvature and rotation are diminished when the weight of the upper part of the body is removed from the vertebral column. This weight may be removed by causing the patient to lie down or to suspend the body by the hands. When the patient is hanging from an overhead bar the deformity largely or entirely disappears. The curved line of the spinous processes partly straightens itself, and the lateral prominences caused by rotation partly subside, and when the patient releases the bar these elements of deformity reappear, the changes occurring with the repeated use of the bar in a sudden and striking manner. They are also seen when the patient alternates between standing and recumbency. If the patient lies prone, the spinous processes arrange themselves in a comparatively straight line and the shoulders and hips approach symmetry. But when the erect position is resumed deformity returns in full force. Doubtless the same alternations occur with the supine as well as the prone attitude, but they are not, from the nature of the case, then visible.

It is an interesting question whether spinal curvature and rotation can occur in a child whose attitude is absolutely uninterrupted recumbency, whose body has never been either actively or passively placed in a vertical position. If we say that the downward pressure of the head and the upper extremities is the immediate cause, and that some, as yet unexplained, inability to properly sustain this weight is the indirect cause, we may be right in the supposition that

absolute recumbency would be a preventive of lateral curvature. However this speculative question may be viewed, the facts above recalled will surely furnish useful hints for the treatment of this deformity in a growing child. "As the twig is bent the tree is inclined," is a proverb applicable here. It follows that suspension and recumbency are two attitudes which should be prescribed, and the more time given to them the greater is the advantage to be gained from the growth of the patient. In suspension there should be no muscular effort beyond that required to keep the fingers flexed on the suspension bar, and in the meantime the body should swing gently, as a means of timing the suspension, seven vibrations, backward and forward, measuring one-quarter of a minute, which is commonly sufficient for each effort. Recumbency should be practised several hours daily, the position being supine, with an air-pillow so placed under the back as to maintain lordosis, and this should be observed so far as it is practicable at night.

Continuing our observations, it is seen, sooner or later, that fatigue or general weakness increases the deformity. If the patient comes in after a long walk or a tiresome journey, or if she is suffering an indisposition, the deformity is greater than it would otherwise be. So that if the patient is pale and tired, examination will reveal more than the customary curvature and rotation; while, on the other hand, if she is not tired and is sustained by good sleep and digestion, the general well-being will find expression not only in the face, but also in a diminution of the curvature and rotation.

The fact that the intervention of general fatigue increases the deformity is in accord with the view that one of the causes of lateral curvature is muscular failure to hold the spine erect under its natural burden. A sequence of causes may be arranged as follows: Diminution of the capacity of the chest is caused by rotation; rotation is caused (1) by the comparative wide lateral excursion of the bodies of the vertebræ, while the processes are hindered from wide lateral mobility by their entanglement in the posterior parietes; rotation is caused (2) by the curvature; the curvature is caused by failure of the muscular system of the spine to hold the vertebral column erect under its natural burden; failure of the muscles to do their duty is caused by defective innervation; the cause of defective innervation is as yet conjectural.

Whatever may be thought of this arrangement of factors, practically we may accept a hint from the observation that fatigue accents the deformity. Throughout the growing period over-exertion should be avoided. The child should not be told to "sit up straight," but rather to lie down. The recumbent position should be often taken and for long periods. Moderation should be the rule in all active amusements, and in all the duties, physical and mental, which fall to the lot of the child at home and at school.

Continuing our clinical observations we become aware of the fact that the chest is expanded during suspension. This attitude expands the chest with as much directness as manual traction and counter-traction enlarge the cavity of a pair of bellows. The anatomical and physiological reasons for this effect were originally stated by our honorary member, Dr. Henry G. Davis.[1] When suspension is practised the muscles which pass from the ribs to the humeri attach the sternal ends of the ribs to the suspension bar by the intervention of the arm, forearm, and hand, while the vertebral ends of the ribs are powerfully drawn downward by the combined weight of the lower part of the body and the lower limbs, producing forced inspiration in a very positive manner. This position is an exaggeration of Sylvester's method for the resuscitation of the apparently drowned, in which the operator produces artificial inspiration by drawing the arms forcibly above the head. In suspension, however, the force applied is the weight of a large part of the body, and is much greater than can be applied by manual traction on the arms of a supine patient. The repeated and persevering application of this force may reasonably be expected in time to have a lasting effect on the size of the thorax and the capacity of the lungs, and further consideration will show that in this agent we have a method of directly opposing the deformity, of doing what we vainly try to do by the use of mechanical pressure. A brace is powerless to reduce rotary lateral curvature. Its application is injurious rather than beneficial. As the ribs are attached chiefly to the processes instead of the bodies of the vertebral column, the first effect of the

[1] On the Development of the Thorax by Special Exercises, as a Prophylactic and Remedial Measure in Phthisis and other Chronic Affections of the Lungs. American Medical Monthly, March, 1858, pp. 161–173. Conservative Surgery, 1867, pp. 283–307. These pages were reprinted with the title "Curability of Pulmonary Consumption."

lateral pressure made by a brace on the ribs is to increase rotation and curvature and contraction of the chest. With suspension, however, what we cannot do by pressure from without we can do by overfilling or distending the space within by a forced development of its normal contents. The emphasis thus given to the value of suspension is increased by the consideration that improved respiration applies a stimulus to the general health and indirectly gives tone to the muscular system, whose failure is one of the causes of lateral curvature.

Our knowledge of the pathology of this affection is insufficient to determine its treatment, but clinical observation provides a rational ground for active and persevering treatment, with a certainty of preventing an increase of deformity and a prospect of improving the condition in favorable cases.

AN ETIOLOGICAL FACTOR IN LATERAL CURVATURE.

By E. G. BRACKETT, M.D.,
BOSTON.

Whatever may be the initial point in the etiology of lateral curvature, there is one underlying condition which is an important factor in its increase and growth—that of the gradual structural change which occurs under the maintenance of the distorted position. Not only do the ligaments and the bones yield to the force of unequal pressure, which must necessarily result from the deformity, but the muscles also undergo adaptive change, and when once the distortion is established, with the unequal distribution of weight and muscular action which is necessary in an equal poise of the body, all factors act in one way to increase the development of this condition. The amount of increase of the deformity will depend much upon the individual conditions, such as the natural laxity of ligaments, by which the deformity is allowed, under weight, to remain at its greatest degree; the amount of muscular weakness, which allows under easy fatigue a greater strain to come on the already weakened ligaments, and the condition of the bone, according to its density and firmness, which offers a greater or less resistance to the change in the shape under unequal pressure.

Although this may be regarded as an explanation of one of the reasons of the increase of a deformity once started, it cannot be considered as an important factor in the beginning of these cases, before changes have had time to occur, and we must, therefore, look for some other condition before this has become so pronounced as to be a factor of importance. In these former cases, in which there has been a decided degree of deformity already developed, there is a sufficient reason, both in the structural change and in the

resulting unequal distribution of weight and of muscular action, to explain not only the continual assumption of the malposition, but also its gradual increase.

It is necessary for the symmetrical poise of the body to have a symmetrical framework. We must consider that the changes in outline of figure are simply indications of some underlying asymmetrical condition, and are to be regarded, therefore, as symptoms only. If we consider that the trunk is formed by a uniform placing on a central column of symmetrical parts, and if this cen-

FIG. 1.

tral column is in any way changed, we must have an asymmetry of outline. It is also just as essential that there should be asymmetry of action and function; therefore while asymmetry of structure will give a permanent distortion in form, asymmetry in function will give a postural distortion.

In the older cases the original cause interests but little, as the condition has progressed to the point that this has but little or nothing to do with progression of the case, and, therefore, has but little bearing in the treatment; but the pathological change which

has occurred claims all attention. But this does not explain the frequent presence of a particular attitude in the early cases where the deformity is insufficient to explain the condition; and yet it is a well-recognized fact that these cases assume an habitual postural curve, which is decidedly more noticeable when there is evidence of muscular fatigue; and all cases must pass in their early stages of development through this condition, for which there must be some explanation. This condition is found in very many of the early cases which are brought for asymmetry of outline of figure,

FIG. 2.

such as dropping of the shoulders, a prominent scapula, or a change in the shape of the waist, when there is no visible change in ordinary examination to explain. These cases are capable at this time not only of complete correction, but over-correction, and we must, therefore, look for some underlying cause which will explain the frequent, involuntary assumption of this particular attitude; and the importance of this cannot be too strongly urged, as it leads not only to its increase, but to the development of ordinary forms of scoliosis. There are many cases of light degrees of

postural curves in which it is almost impossible to find the cause, either for its beginning or for its increase. The story that is given by the parents is frequently that the child habitually assumes certain vicious attitudes, most frequently and most marked when tired. Although this occurs, as a rule, in the weak and poorly muscularly developed children, it is by no means universal, but is frequently found in children whose physique is beyond criticism; and although with a well-developed lateral curvature, with osseous change, it is easy to see why the vicious attitude should not only be maintained, but that it is impossible that the position should be otherwise, yet in many of the lighter curves, in which correction is not only possible, but over-correction is easily brought about by the child's voluntary efforts, this needs a different explanation.

This condition is found in many of the early cases which are brought simply for the dropping of the shoulders or for the asymmetry of outline of waist; and the importance of this is not easily overestimated, as the increase of the developing curve cannot be too strongly urged, as it leads to the constant assumption of an attitude which needs only its increase to resemble the ordinary form of scoliosis.

It must also be considered that it is decidedly unscientific to regard these cases as unequal shoulders, or prominent scapulæ, or of high hip, as these are simply symptoms of some underlying condition acting as its cause. As in the same way it would be unscientific to regard a pneumonia as a condition of cough and pain, it will be acknowledged that there must be some reason why a child should constantly assume one particular attitude of malposition, other than the cause of pure muscular fatigue. It is not to be assumed that all cases have their origin from one common cause, for the very many conditions which may have the influence and the origin of lateral curvature are well recognized, but we may find conditions in very many of these early cases which, although evidently not the primary origin of the trouble, frequently explain the condition found at this time.

We must remember that the spine, to be normal in shape, must be composed of symmetrical segments properly placed together, and to be normal in function should be so joined together that the joints formed by their union possess an evenly distributed amount of mo-

bility, and for this the ligaments which bind together the component parts should allow a uniform play of motion, and the muscles be so evenly balanced as to maintain without effort an even poise. Therefore, an interference with the normal function of the spine as well as a distortion of the shape of its segments will give changes in the trunk outline of the figure.

In light cases this bony distortion, which in the severer cases prevents complete correction, does not exist, and we must look for other causes to explain the frequent assumption of these particular malpositions. That a child, when tired, should tend to lean to one or the other side is not surprising; but that it should always assume a particular attitude needs an explanation, which may be found in a majority of such cases in a difference in the lateral flexibility of the spinal column. Before a change has occurred which in any way prevents correction or over-correction to a marked degree, there will be frequently found a decided difference in bilateral mobility. For instance, flexibility to the right may be represented by fifteen, and to the left by ten degrees, or, in other words, the laxity of the ligaments allows the spine to bend to the one side but one-half as far as to the other. The result of this is that the point at ease, which will be represented by the midline of these extremes, the position of equilibrium, is not the upright position or the position of symmetry, but a point placed to one or the other side of this. The result of this is that when a child's attention is not given to its position and the muscles are relaxed, the spine naturally falls to its position of equilibrium, as it may be called, which is a position to the side of the normal symmetrical outline. This becomes the habitual attitude of ease, whether sitting or lying, so that while the spine is frequently bent to its limit on its concave side, it seldom is forced to this limit in the opposite direction, and thus we have a continual exercise which tends further to increase the disparity of flexibility.

The part played by the muscles is an important one, and is the result of the gradual change which they undergo to adapt themselves to the position of the spine. It is a fact well illustrated in clinical experience that such changes occur in the length and action during growth, adapting themselves to the change of position, and, although the natural elasticity of the muscles allows motion through-

out a large area, the relative position of the part is governed by the balance of antagonism rather than the comparative strength.

The method of testing the mobility as well as the strength is one of much importance, as the uniformity of results of examination depend upon the accuracy of the conditions in the different trials. To obtain an accurate estimate of the amount of lateral flexibility, it is necessary that the child should bend directly to the side, and in no way rotate the trunk or to bend forward. This may be accomplished by the following method: if the child is made to stand with the feet slightly apart, leaning with the hips, chest, and the head on a vertical board, and with the hand on the side toward which the bending is to be tried, reaches as far downward on the thigh as possible, keeping in contact with the board, with both heels on the floor, it will be found that the same conditions can be had at each trial. If in this position the intersecting line between the seventh cervical vertebra and the fold of the buttock is marked, it will show the amonnt of bending of the spine. The amount of deviation of this line, both from the midline of the back and from the spinous processes, can then be accurately measured and compared.

The same method of testing the strength may be used as that for testing the amount of flexibility. It is, of course, impossible to isolate not only muscle or any group of muscles, but it is possible to compare the general strength of either side, providing the tests are carried on under the same conditions in different trials. A disparity in record is usually due to the child assuming a different position, so that its point of pull at different trials varies. Most frequently this is due to a leaning forward, in which the direct pull of the back is added to the pull of the side; but this may be prevented by the use of the vertical board in the same manner as in the test for flexibility, except that the child can place the back against the board, and, leaning to the side, grasp the dynamometer, which is fastened to the floor. Much has been said, although little seems to have been proved, about unilateral weakness as a factor in the etiology of lateral curvature; the writer does not offer these results as evidence of muscular insufficiency, as they are quite too few for such, but they are given for comparison with the condition of flexibility of the individual cases. As it will

be seen the results do not show uniformity; but it is not at all certain that a difference is not due less to the difference in strength than to the ease of the position, which allows the strength to be used to greater advantage.

Case.	Flexibility to		Strength of	
	Right side.	Left side.	Right side.	Left side.
1.	$3\frac{1}{2}$	2	25	30
2.	$3\frac{1}{4}$	$2\frac{1}{2}$	35	34
3.	3	2	54	64
4.	2	$1\frac{3}{4}$	20	25
5.	$2\frac{3}{4}$	$1\frac{3}{4}$	14	24
6.	2	$1\frac{1}{2}$	27	33
7.	$3\frac{1}{2}$	$1\frac{1}{2}$	26	33
8.	$2\frac{1}{2}$	$1\frac{1}{2}$	34	32
9.	$1\frac{3}{4}$	$1\frac{1}{2}$	27	25
10.	$2\frac{3}{4}$	$1\frac{3}{4}$	32	42
11.	2	$1\frac{3}{4}$	20	25
12.	$2\frac{1}{2}$	2	27	34
13.	$2\frac{3}{4}$	$1\frac{1}{2}$	21	18
	$34\frac{1}{4}$	23	362	419
	Left side.	Right side.	Left side.	Right side.
14.	$3\frac{1}{4}$	$2\frac{1}{2}$	33	22
15.	$2\frac{1}{2}$	2	16	13
16.	$2\frac{1}{2}$	$1\frac{3}{4}$	42	32
	$42\frac{1}{2}$	$29\frac{1}{4}$	453	486

CASES ILLUSTRATING THE ABSURDITY OF TREATING ORDINARY LATERAL CURVATURE (SCOLIOSIS) BY SPINAL SUPPORTS.

By BERNARD ROTH, F.R.C.S.,
LONDON.

Any ordinary case of lateral curvature of the spine, where the patient is fairly intelligent and co-operates in the treatment, can be practically cured by a course of three months' daily treatment by "posture and exercise" according to the methods described in my article "Lateral Curvature of the Spine" in Heath's *Dictionary of Practical Surgery*, 1886.[1] By "practical care" I mean that the sufferer will have, as the result of the treatment, a strong and usually much straighter back, with arrest of further increase of the osseous—*i. e.*, incurable deformity of the ribs and vertebræ. At the same time the patient's general health is much improved, and backache, if present, is much relieved, and in most cases removed. I am preparing a paper giving the analysis of 1000 consecutive cases of lateral curvature which have been under my treatment since I published a first series of 200 cases in the *British Medical Journal* of October 31, 1885, upward of 900 of which were practically cured by the usual three months' course of daily treatment. I attach great importance to the word "daily." Several surgeons, to my knowledge, have supposed themselves to be carrying out my treatment by seeing a patient once a week or once a fortnight, relegating the treatment in the intervals to a relative or nurse; as may be easily imagined, their results have been less successful than mine, and these same surgeons have more often than not, relapsed into the old-fashioned treatment by spinal supports. During the twenty-one years I have been in orthopedic

[1] See also my book, "The Treatment of Lateral Curvature of the Spine," published by H. K. Lewis, Gower Street, London.

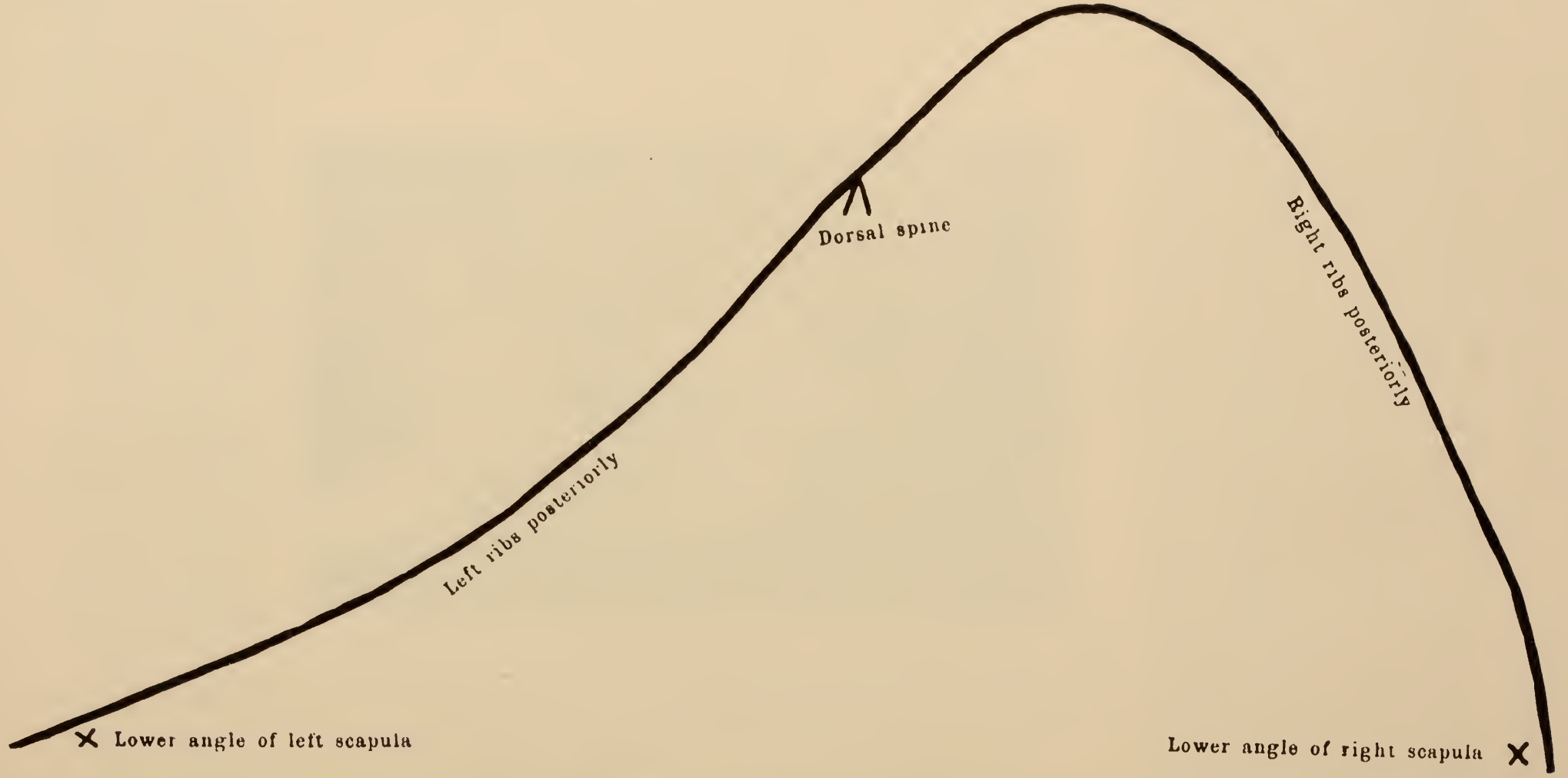
practice I have never put a patient with lateral curvature into spinal supports, except in a very few cases of severe infantile paralysis of the erectores spinæ muscles, where, by no voluntary muscular efforts, the patients could place themselves in an improved posture.

Case I.—Miss A. L., aged seventeen years and a half, was sent to me on October 20, 1885, by a well-known hospital surgeon in London. This gentleman had commenced the treatment of the patient for lateral curvature five years previously, when, according to the state-

Fig. 1.

ment of her aunt, she was not more deformed than her younger sister, whose photograph is given in Fig. 1. She wore a succession of Sayre's plaster-of-Paris jackets, followed by a poroplastic felt spinal support, which she was wearing when she came to me. She also wore a jury-mast arrangement for twelve months during these

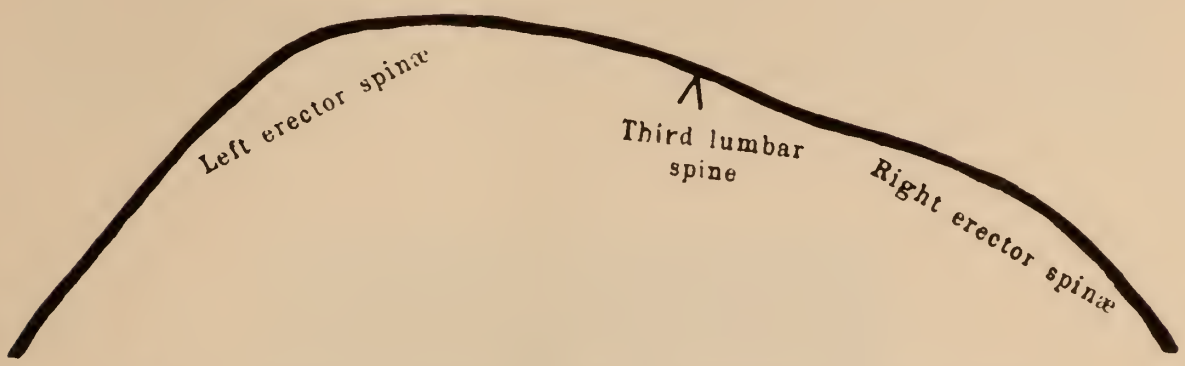
FIG. 2.



Miss A. L., aged seventeen and a half years, October 20, 1885. (Actual size.)

five years, and she was, in addition, suspended by the head and neck for ten minutes daily in the "gallows." All this treatment failed to

FIG. 3.



Miss A. L., aged seventeen and a half years, October 20, 1885. (Actual size.)

FIG. 4.

prevent the development of the very serious deformity with which she came to me.

Present state (October 20, 1885) "A delicate, anæmic, and extremely deformed young woman, with the left shoulder much depressed; she has never had backache, which is frequently the case even in the most deformed patients; her general health is said to be good. The spine presents extreme lateral curvature with dorsal (upper) convexity to the right. The lower angle of the right scapula and the left iliac crest are very prominent. The antero-posterior

FIG. 5.

curves of the spine are much exaggerated. When the trunk is flexed to the full extent the right ribs posteriorly, are very prominent as compared with the left." (See Fig. 2.) This is a tracing taken by my scoliosiometer from the lower angle of the left scapula across the spine to the corresponding angle of the right scapula; the left erector spinæ muscle is much raised by the corresponding convexity to the left of the lumbar vertebræ. (See Fig. 3.) The tracing is taken opposite the third lumbar posterior spinous process.

When the patient was placed in the best possible posture, the poroplastic felt jacket and her dress would not meet across the chest by several inches. My prognosis was that a course of three months' daily treatment would effect all the improvement possible—*i. e.*, an improved figure, strong spinal muscles, and most probably arrest of further increase of the osseous—*i. e.*, incurable deformity of the ribs

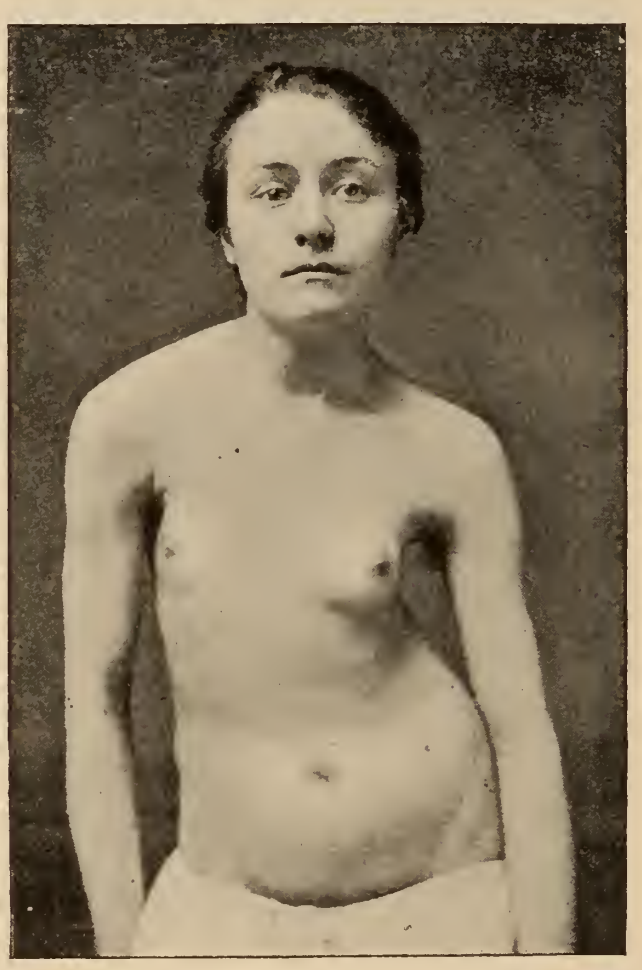
FIG. 6.

and vertebræ; at the same time she would be independent altogether of spinal supports and become a much more useful member of society.

On November 3, 1885, I took a series of nine photographs, Figs. 4 to 12 inclusive, which almost explain themselves. Fig. 4 shows the felt jacket being worn, posterior aspect; Fig. 5 shows the felt jacket being worn, anterior aspect; Fig. 6 gives the patient in her habitual position, seen from behind, and may be compared with Fig.

4 to demonstrate how little effect the felt jacket had in maintaining an improved posture; Fig. 7 is the same as Fig. 6, seen anteriorly, and may be compared similarly with Fig. 5. Fig. 8 shows the patient in her habitual position viewed laterally. Fig. 9 represents the patient placed in the "best possible" or most erect position, and demonstrates that the felt jacket is several inches too tight under such conditions; this figure should be compared with Fig. 5. Fig.

FIG. 7.



10 gives the patient's trunk flexed, and is a gauge of the amount of osseous or incurable deformity of the ribs posteriorly; it may be usefully compared with Fig. 2, proving how very accurate are the scoliosiometric tracings taken by my method in this flexed position. Finally, Figs. 11 and 12 give the anterior and posterior views of what I describe as the "keynote" position—*i. e.*, the best position in which the patient can, by voluntary effort,

directed by the surgeon, place herself while undergoing methodical exercise.

A few days later I exhibited the patient before the Clinical Society of London, and the following day I commenced daily treatment by "posture and exercise." On December 12, 1885 (twenty-fifth visit for treatment), the patient informed me that she felt much stronger, and that her friends already observed a marked improvement in her figure. On the completion of her course of three months' daily treatment (seventy-two visits) she was again presented to the Clinical Society on March 12, 1886.

FIG. 8.

The patient perserved with a home-prescription of treatment for a year (half an hour twice a day for the first six months, then once a day for another six months) when I exhibited her again before the Clinical Society, March 7, 1887. I was able to demonstrate that

there had been no further increase of the osseous deformity and that my prognosis had so far been fulfiled. On December 4, 1888, two and three-quarter years after the completion of the three months' course of treatment the patient's aunt wrote: "The deformity is no worse, . . . when she has time she is able to take long walks." I did not see her again till for the purposes of this paper I asked her to come and visit me on June 5, 1895, after an absence of eight

FIG. 9.

years, when I found there had been no increase of osseous deformity as tested by the tracing of the ribs posteriorly; her general strength and health have kept good during the ten years since she ceased treatment; in fact, considering her extreme deformity and weakness at the time she first came to me, I do not think she could have done better.

CASE II.—The younger sister, Louisa L., of Case I., aged fourteen years, was brought to me on February 8, 1886, with well-

marked lateral curvature of the spine, but with only slight osseous, *i. e.*, incurable deformity of the ribs and vertebræ; see habitual posture in Fig. 1. This girl underwent only one month's daily treatment by "posture and exercise," which sufficed to cure her. This was confirmed when she was shown at the meeting of the Clinical Society, March 11, 1887. More than a year later the aunt reported, "she carries herself most uprightly." Seven years later,

FIG. 10.

May 31, 1895, the same relative wrote that the patient "had grown a fine young woman," which I was able to verify for myself when she accompanied her sister in June, last year. Will not any impartial surgeon agree with me in believing that if the unlucky elder sister had received the same treatment at the corresponding stage of her deformity she would have had eventually as straight a figure as the younger girl?

Case III.—Miss M. W., aged sixteen years, the youngest of eleven children, was brought to me January 10, 1891, with the following history: When five years old, a well-known London surgeon ordered her a poroplastic felt spinal jacket, as well as to lie down several hours daily. Getting worse after three years of this treatment, she was taken seven years ago to an orthopedic surgeon who has treated her up to the present time. At first he kept the patient

Fig. 11.

lying prone strapped down all day; during the night a steel spinal support was worn, as it was found that she could not sleep if the strapping down in the prone position was continued at night. After two or three years of this treatment her legs became so weak that she had to use crutches. A year ago, *after six years* of this treatment, the surgeon gave the mother to understand that he could not do anything more for her daughter.

Present state, January 10, 1891. A delicate, emaciated young woman, who came tottering into my consulting-room on crutches, helped on one side by an elder sister. She is wearing a heavy steel spinal support. She, like Case I., has seldom had acute backache.

Spine. There is extreme lateral curvature with dorsal (upper) convexity to the right, see Fig. 13, which is a rough sketch of her back; this shows the great prominence of the lower angle of the

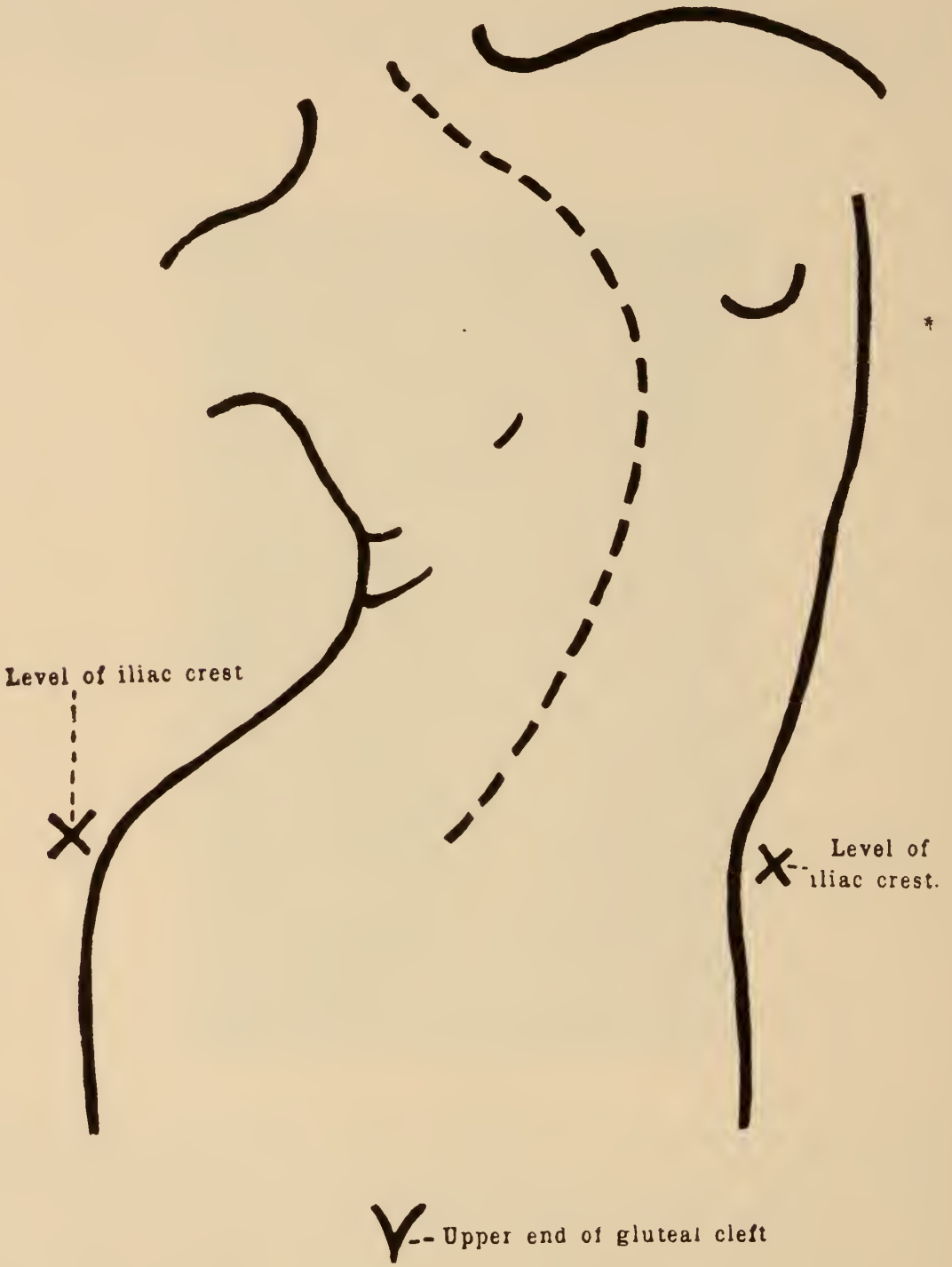
FIG. 12.

right scapula and of the left iliac crest. The antero-posterior curves of the spine are much exaggerated, causing what I describe as the "gorilla" type with very prominent abdomen.

Figs. 14 and 15 represent the scolosiometric tracings of the ribs posteriorly and the erectores spinæ muscles respectively; the tracing of the ribs posteriorly presents extreme torsion of the dorsal vertebræ. When the girl was placed in the best possible position her dress and

spinal support were much too tight, not meeting within three or four inches. My *prognosis* was that a course of three months' daily treatment would effect all the improvement possible, *i. e.*, increase her

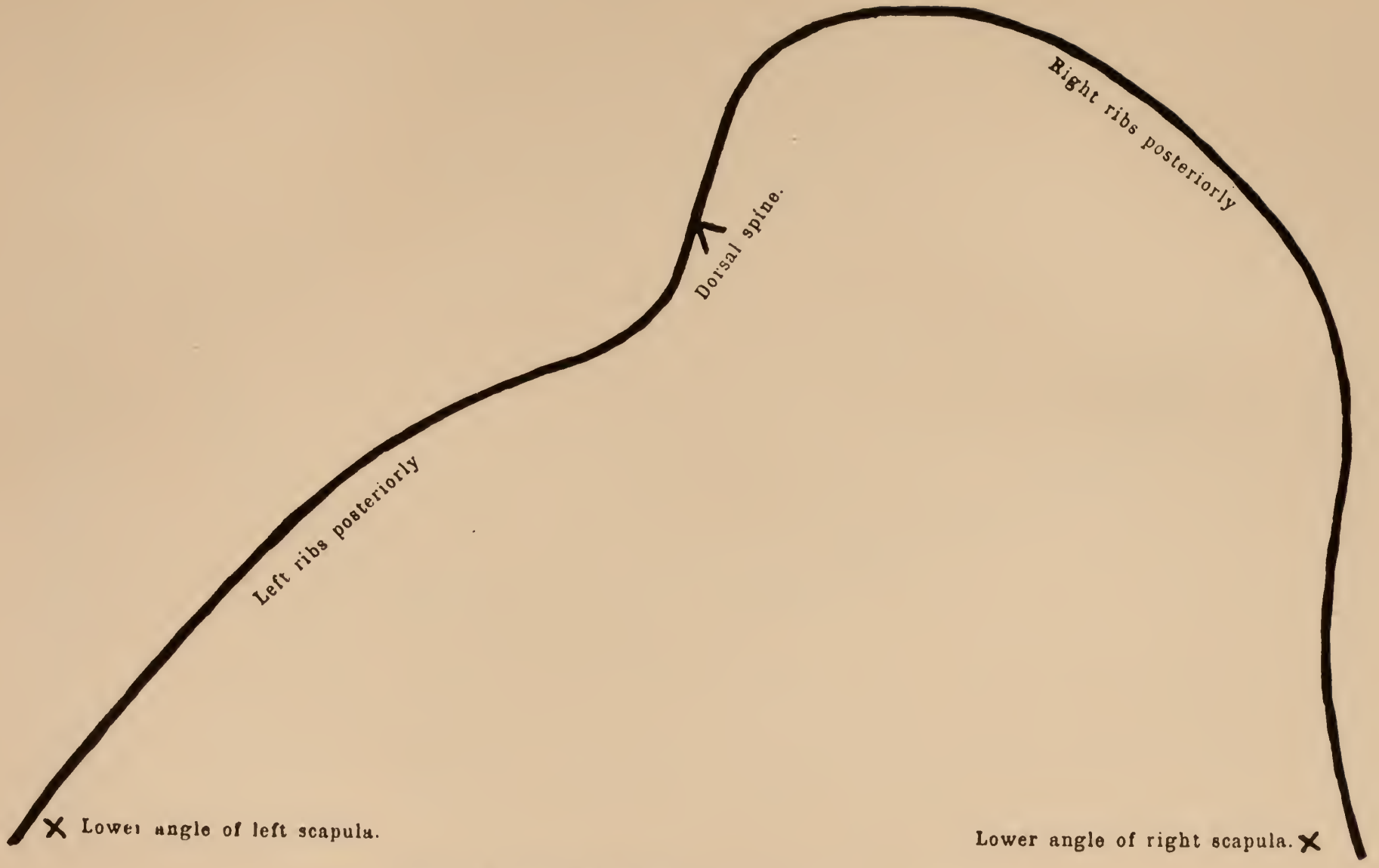
FIG. 13.



Miss M. W., January 10, 1891.

strength and improve her health so that she would be able to walk without crutches, and that probably further increase of the osseous de-

FIG. 14.



Miss M. W., aged sixteen years, January 10, 1891. (Actual size.)

formity would be arrested. The patient completed her course of three months' daily treatment (seventy-two visits), April 14, 1891, when

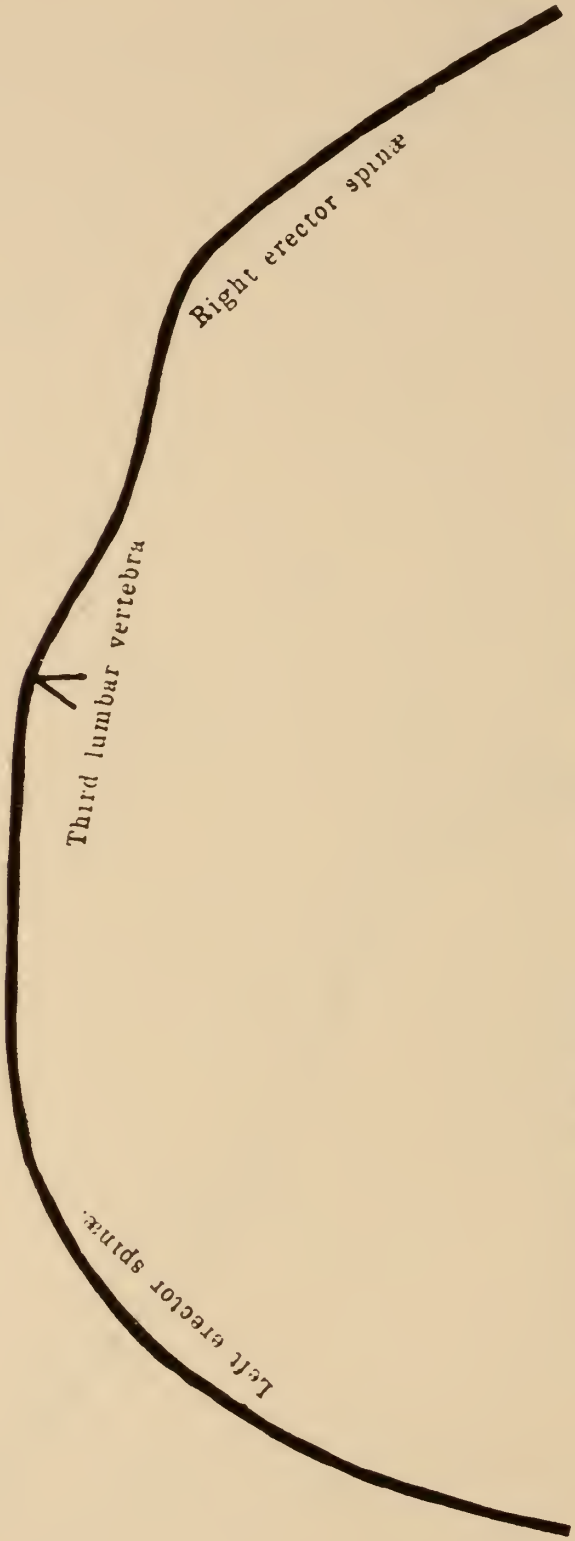


FIG. 15.

Miss M. W., aged sixteen years, January 10, 1891. (Actual size.)

I dismissed her with a home-prescription for twelve months. Two days later the mother wrote: "She has to thank you for her strength

and power of walking about." On October 1, 1891, the patient wrote: "My sister says I hold myself much better, and my exercises (home-prescription) are much easier to me now." On examination at the end of the year, April 13, 1892, there had been no further increase of the osseous deformity when tested by the tracings. Eighteen months later I was informed she was able to walk four miles in the course of the day without the mechanical help of spinal support or crutches. On January 15th, last year, I saw the patient again after an absence of three years, and was pleased to find her looking remarkably well, and that since I examined her first, four years before, there had been no increase of the osseous deformity. At that time she looked so ill and weak that I do not think her life could have been much prolonged if the instrumental treatment she was then undergoing had been continued. A marvellous change for the better took place as soon as she was treated on what I presume to call "common-sense" surgical principles; she has now every prospect of a strong and happy life before her, in spite of the terrible deformity with which she is afflicted, which deformity might so easily have been prevented had she been properly treated when the scoliosis first set in.

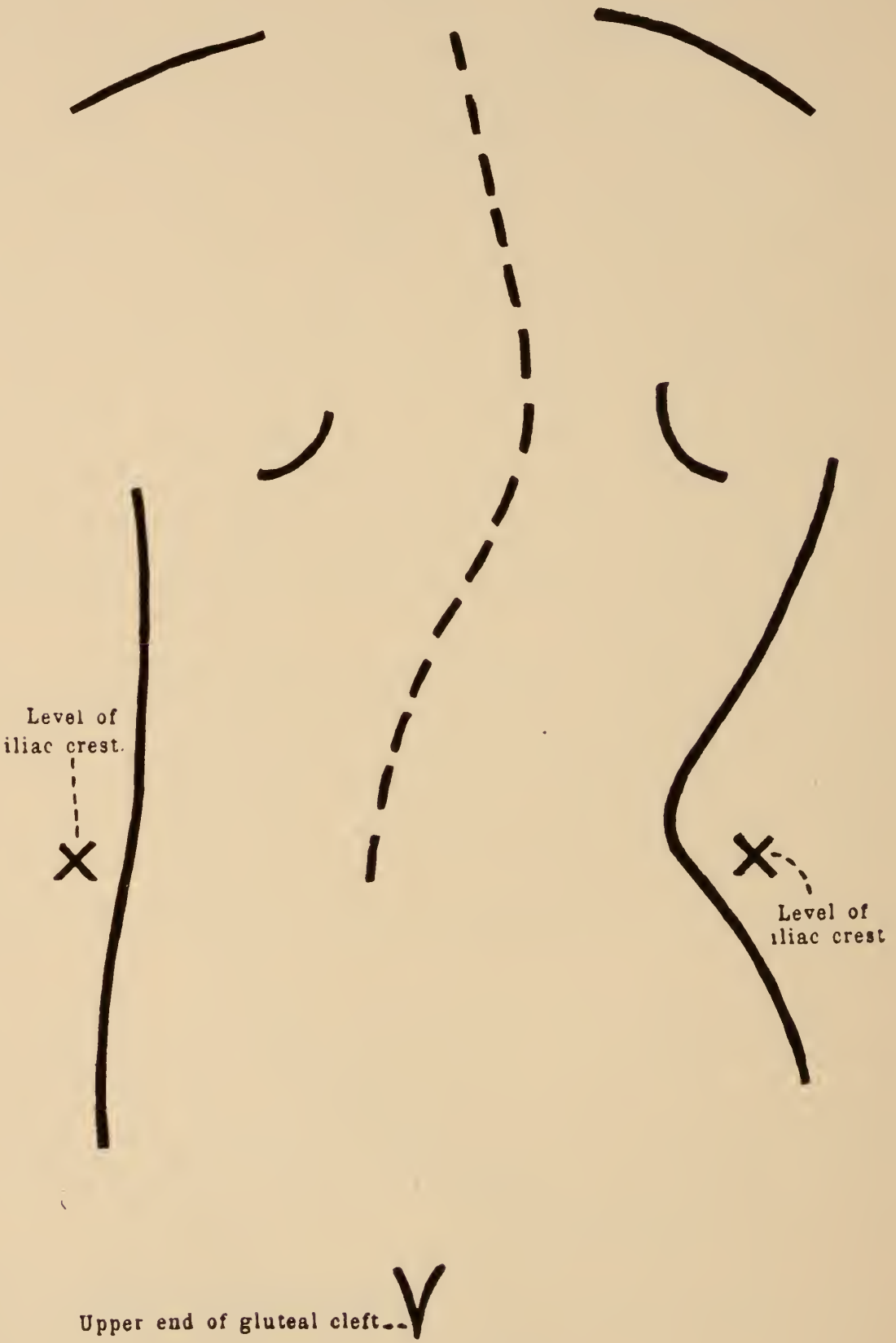
Case IV.—Mrs. A., aged fifty-seven years, consulted me July 27, 1888. This is the most extraordinary case of maltreatment of lateral curvature by spinal supports I have ever come across, as far as duration of treatment is concerned. This lady had worn steel spinal supports for nearly forty years. Her son, a medical man, wrote to me "my mother has worn a support for many years, and has suffered an incredible amount of pain from the deformity, which would seem to be of a neuralgic character, coming and going suddenly."

History. When the patient was fifteen years old, a then well-known orthopedic surgeon ordered a steel spinal support. This was worn till she was married, and then left off for a few years. Twenty years ago another surgeon prescribed a new kind of steel support, which has been worn constantly ever since, for twenty years, under the same surgeon.

"*Present state.* July 27, 1888. A fairly well-nourished woman with severe lateral curvature with dorsal (upper) convexity to the right (see Figs. 16, 17, and 18, which show respectively the rough

sketch of the back and the scoliosiometric tracings of the ribs posteriorly, and of the loins opposite the third lumbar vertebra). She

FIG. 16.



Mrs. A., July 27, 1888.

can be placed in a much improved position, as the spine is still fairly movable in spite of the osseous deformity." The patient commenced three months' daily treatment October 3, 1888, and by November 16, (fortieth visit) she had improved so much as to have been for the

FIG. 17.

Mrs. A., aged fifty-seven years, July 27, 1888. (Reduced one-half linear.)

last eight days entirely free from pain; such a long relief had not occurred for many years past. This lady left me much improved at the end of three months' treatment. There were, however, from time to time relapses of the neuralgic pain in the back, and in May, 1889,

she came for a further course of two months' daily treatment (forty-eight visits), and was again considerably relieved. In October, 1889,

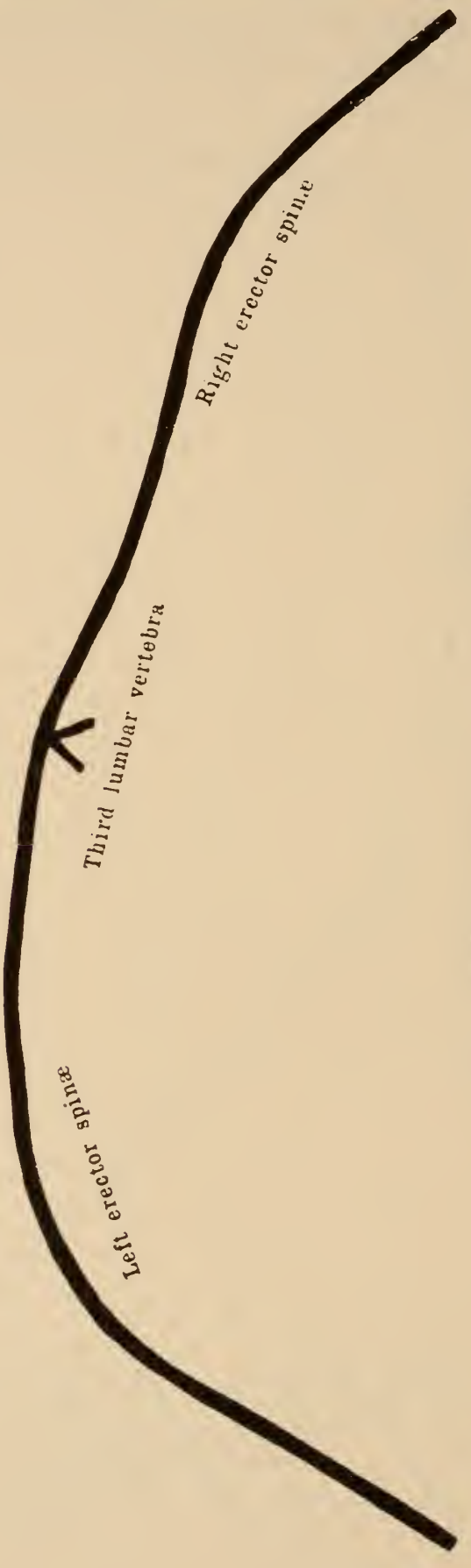
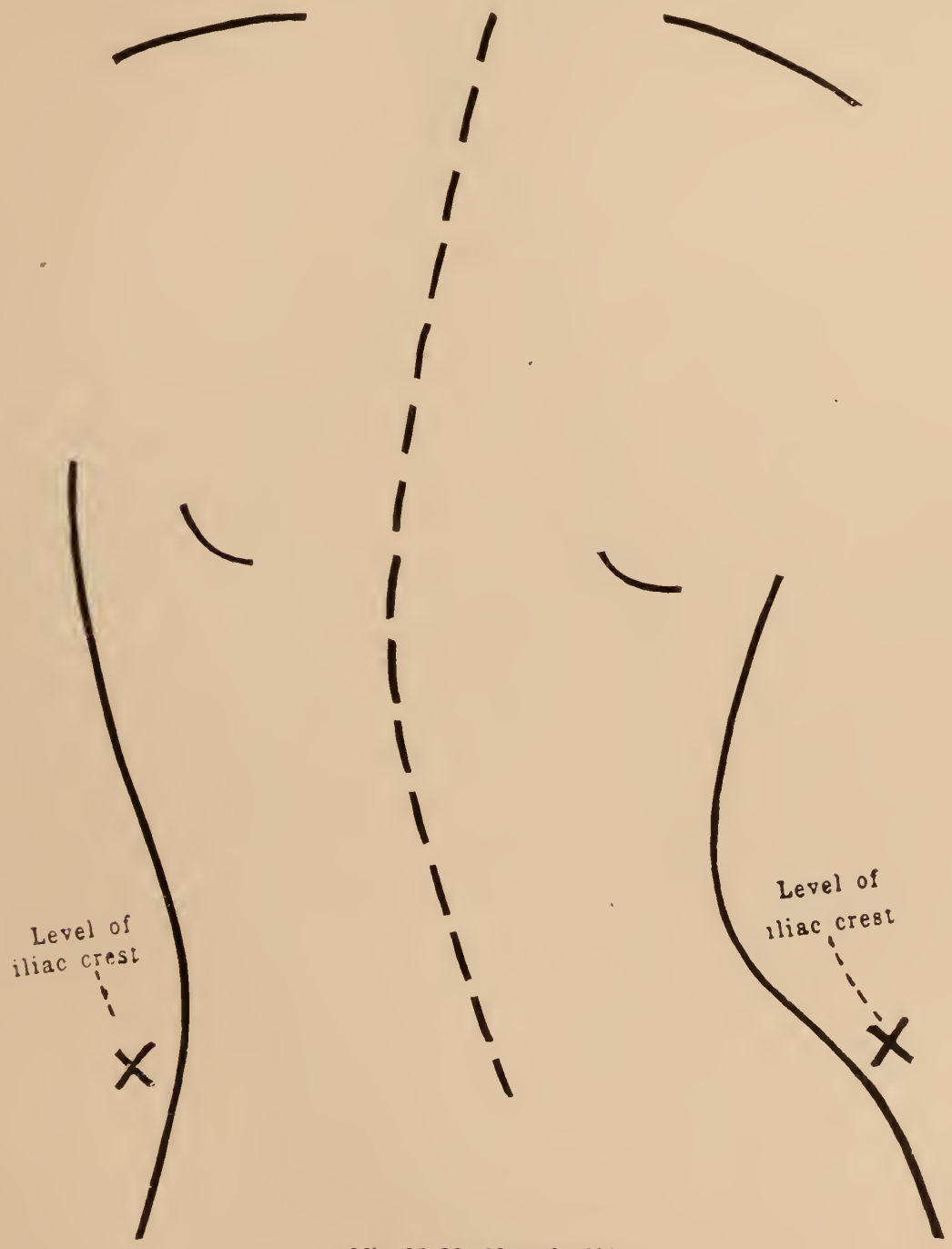


FIG. 18.

Mrs. A., aged fifty-seven years, July 27, 1888. (Actual size.)

four months after leaving me the second time, she wrote: "I am very much better and stronger." This patient continued to suffer at intervals from the neuralgic pain in the back in spite of all reme-

FIG. 19.



Miss M. M., May 16, 1894.

dies, but she was able to get about better and to enjoy a sense of freedom which she had not experienced for nearly forty years. From the first day this lady consulted me she left off her spinal support,

and never wore it again; like other patients, she felt very limp and as if she would fall to pieces for a few days, but the spinal muscles soon commence to do their duty, and it is seldom a patient has any

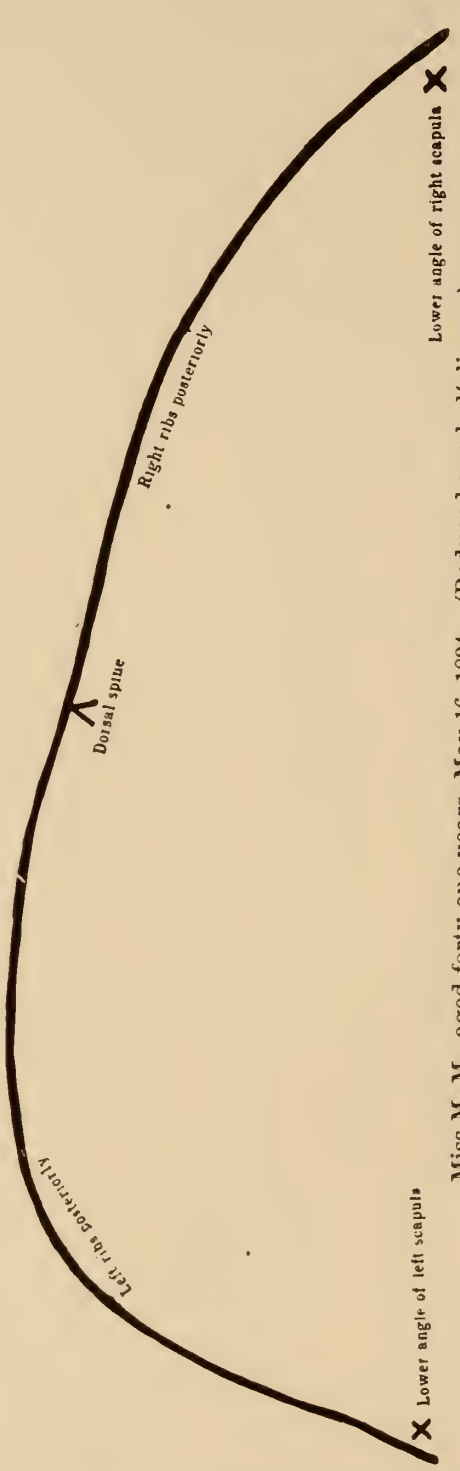


FIG. 20.

Miss M. M., aged forty-one years, May 16, 1894. (Reduced one-half linear.)

desire to have a spinal support reapplied after the first week or two of the daily treatment by "posture and exercise."

CASE V.—Miss M. M., aged forty-one years, came to me May 16, 1894, with the history that at twenty-one years of age the same

surgeon who had treated Case IV. had ordered her a steel spinal support, which she was still wearing, having, of course, had it

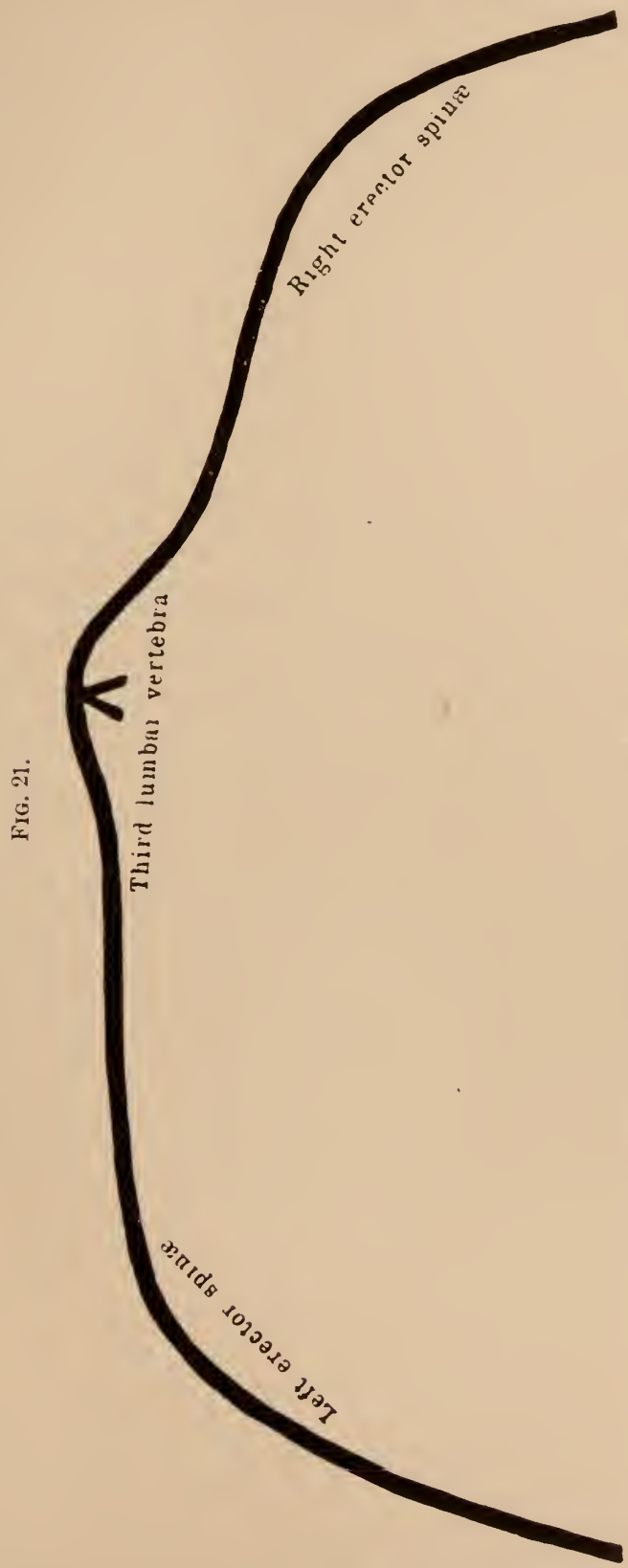


FIG. 21.

MISS M. M., aged forty-one years, May 16, 1894. (Actual size.)

renewed several times during the twenty years' treatment. Some eight years ago the surgeon told the patient he could do nothing

more for her beyond advising her to continue the spinal support, and this advice she followed.

"*Present state.* A tall thin woman, who declares she can do nothing without the spinal support. The spine is curved with the whole convexity to the left (see Fig. 19, giving a rough sketch of the back), while the left ribs posteriorly and the left erector spinæ muscle are both too prominent (see the scoliosiometric tracings, Figs. 20 and 21). The spinal support and dress do not meet for four inches in front when she is placed in the best posssible position." I at once removed the spinal support, which was of the usual type, with sub-axillary crutches. The patient left me at the end of the three months' daily treatment (seventy-two visits) greatly improved in every way. I last heard from her on January 21, 1895, when she wrote: "My general health is very good, indeed. I am happy to say the pain in my back has almost entirely disappeared, and I am able to walk more than I have done for years. Your treatment has certainly done me an immense deal of good."

Here again a victim to spinal supports for twenty years became a reformed character as far as health, strength, and figure are concerned by a comparatively short course (three months) of daily treatment.

I shall be glad if by the narration of these typical cases I am able to convince some surgeons that I was justified in the choice of my title for this paper. I will conclude with an extract of a criticism in the *Lancet* of August 3, 1889, on my *The Treatment of Lateral Curvature of the Spine*—"It is to be hoped, too, that the publication of this little book will do something to check the unscientific and often disastrous treatment of lateral curvature by spinal supports and prolonged rest."

ON SOME RECENT MODIFICATIONS WHICH I HAVE ADOPTED IN THE TREATMENT OF CONGENITAL WRY-NECK.

By WILLIAM ADAMS, F.R.C.S.,
LONDON.

In the present paper I desire to bring before the members of the American Orthopedic Association the treatment of congenital wry-neck, with especial reference to some modifications which I have recently adopted. I have been induced to bring this subject before the American Orthopedic Association, because the greatest improvement made has been by adoption of the American principle of extension—undoubtedly one of the most important principles of modern surgery applicable to many affections, as described in my post-graduate lecture "On the Surgical Treatment of Deformities," *Post-Graduate Lectures*, London, 1893, p. 32.

In England we never forget to acknowledge how much we are indebted to the genius and practical ability of the American surgeons; and in the treatment of congenital wry-neck I have adopted with the greatest advantage the method of Dr. Louis Sayre of applying extension to the head, using the apparatus he recommends in the standing position; and also extension of the head in the horizontal position, the patient lying on an extension couch. By this means I have been enabled to operate as early as three years of age, instead of seven years, the usual period adopted in England, an alteration of the greatest advantage to the patient.

With regard to the recent modifications in the treatment of congenital wry-neck, the chief points to which I would direct the attention of the members are the following:

1. The early period of operation—viz., three years instead of seven years, which has been the general practice in England.

2. Head extension by Prof. Sayre's apparatus, during the treatment—before and a few days after the operation.

3. The use of a felt-jacket with head-gear, instead of the steel spinal support with head-gear.

4. The use of a felt-collar at night, made so as to raise the depressed jaw and bring the head into a fairly straight position.

5. The method of operating should be strictly subcutaneous, my blunt, spear-pointed tenotomy knife being used to divide the clavicular portion of the sterno-mastoid muscle, and avoid the risk of opening a vein.

6. The operation by open-wound is not free from the danger of puncturing a vein; and is open to other objections, especially the growth of the cicatrix, which always increases during the growth, both in length and width, in proportion to the growth of the parts over which it is situated.

Now with regard to the *first* of the recent modifications enumerated—viz., reducing the age at which the sterno-mastoid muscle should be divided from seven to three years—I may state that it has been the surgical rule in England until recently not to operate on cases of congenital wry-neck until the patient had reached the age of seven years. The operation was not undertaken at an earlier age for two reasons:

1. The difficulty of dividing subcutaneously the contracted sterno-mastoid in the fat neck of a younger child—say, at the age of three years—when the muscular outline is ill-defined and the danger of wounding veins increased; and,

2. The inability of a child under seven years of age to wear the mechanical apparatus generally used night and day.

Some years ago I operated upon two children, both boys and first cousins. The elder boy was seven years of age. I had advised delay until that period. The younger boy was a little under six years of age, but he was said to be a very manageable and good-tempered child, and the parents were most anxious to have something done. The sterno-mastoid was sufficiently prominent and the neck not fat. This child, however, became unmanageable as to wearing the instrument more than a portion of the day. The result was that in the younger child the wry-neck contraction never was completely overcome, whilst the elder boy was completely cured and

has remained so. It has only been by the introduction of the American principle of head-extension that I have been enabled to operate as early as three years of age.

The importance of surgical treatment in cases of congenital wry-neck at an early age is very great, as in other congenital contractions, such as club-foot, etc., for as long as the deformity is allowed to continue unrelieved the greater will be the difficulty in curing it; and the more marked will be the various changes that take place, such as the altered shape of the skull, and with it the unsymmetrical condition of the eyes, nose, mouth, and chin, which take place during growth.

It is not only the muscular structures that are involved, but also the deep articular ligaments and the oblique articulating processes of the cervical vertebræ, so that a permanent structural curvature is established in the cervical region. This, again, by disturbing the equilibrium of the body, reacts so as to produce a lateral curvature with rotation in the dorsal and in the lumbar regions.

Then as to the *second* of the recent modifications enumerated—viz., head-extension during the treatment, both before and after the operation—I always employ Prof. Sayre's apparatus, and order extension to be made three times a day for ten minutes each time; and I also use extension in the horizontal position, the child being placed on an extension couch. This should also be done three times a day for ten minutes or longer each time. The effects of this head-extension treatment before operation, is to bring the contracted sterno-mastoid muscle into much greater prominence and definition; to alter the direction of the superficial veins; and to improve the cervical spinal curvature. This treatment should be commenced long before the operation, and renewed in about a week or ten days after the operation. It should then be carried out for a long time, probably for a year or two, varying in different cases.

With regard to the *third* of the recent modifications—viz., the use of a felt-jacket with head-gear, instead of the steel spinal supports with head-gear. There can be no doubt that the felt-jacket must entirely supersede the use of a steel spinal support in these cases; steel spinal supports never can be well adapted to children, who practically have no hips upon which the belt can rest. The

jacket should be perforated for ventilation, and strengthened where required by very light steel bars fastened on to it.

The movements supplied in the head-gear may vary in different cases. In young children it may be sufficient to hold the head in a straight position. In some cases a lateral movement may be required. In more severe cases, at a later age, my favorite movement of rotation must be added to the lateral and uplifting movements, and this can only be done by two long arms extending from the rack-and-pinion movement in the occipital region, one arm with a pad at the end of it leading to the temple on the side of the contraction, and the other arm with a padded trough at the end of it leading to the lower jaw-bone up to the chin.

The rotation rack and pinion must of course be placed horizontally below the joints which move the arms above described, and after these have been adjusted the head can easily be rotated, so that the chin moves toward the shoulder on the side of the contraction. This will tend to elongate the muscle and give the maximum distance between the mastoid process and both the sternal and clavicular attachments, so that the sterno-mastoid muscle will be stretched to the utmost.

Then as to the *fourth* modification mentioned in the list—viz., the use of a felt-collar at night, so as to raise the depressed jaw and bring the head into a fairly straight position. These felt-collars are built up from a piece of felt moulded to the shoulders and chest, with a strap passing under each arm. They form a useful retentive support, and are generally sufficient for night use in children. Other patients sleep in the felt-jacket with head-gear.

Now as to *five* and *six* in the series of recent modifications, these may well be spoken of together. The method of operating should, in my opinion, be strictly subcutaneous, but undoubtedly the greatest care is necessary to avoid wounding any large vein, more especially in dividing the clavicular attachment of the muscle. The fear of this accident will be greatly diminished by the use of my blunt, spear-pointed tenotomy knife, which I always introduce at the posterior border of the muscle, and then carry it forward very close to the clavicle—never more than a quarter of an inch above the clavicle—any stray fibres of muscle, tendon, or fascia can easily be picked up by this blunt-pointed spear. This blunt, spear-pointed tenotomy

knife is figured with the other tenotomes in both the first and second editions of my club-foot book. After the operation I always apply, first, a small compress of lint, held in position by the American adhesive rubber-plaster; over this a large compress of lint should be placed above the clavicle, held in position by the ordinary adhesive plaster on a figure-of-eight bandage.

The operation by open wounds is not free from the danger of puncturing a vein, and is open to other objections, especially the growth of the cicatrix, which always increases during growth, both in length and width, in proportion to the growth of the part over which it is situated. This subject is fully discussed in my *Post-Graduate Lecture*, op. cit. Cases illustrating the growth of cicatrices were published by me in a paper "On the Growth of Cicatrices in Childhood," which I read before the Medical Society of London on the 17th of November, 1873, and published in the *Proceedings of the Medical Society of London*, vol. i. p. 105.

The subcutaneous division of the sterno-mastoid muscle must, therefore, be considered in its scientific principle; the surgical risk is not greater and its ultimate results are very far preferable to the operation by open wound.

Case illustrating the successful application of these recent modifications in the treatment of congenital wry-neck.—Miss S., aged two years and a half, was brought to me by her parents in October, 1893. Some months ago they had noticed that the head was not held straight, and that it could not be brought quite into the straight position; also, that there was asymmetry in the lines of the eyebrows, eyes, nose, mouth, and lower maxillæ. The parents have one other child, an older son, who is quite healthy. There is, however, one other case of wry-neck in the family—the father's sister's child has a similar affection, and the asymmetry is increasing. In the case of my little patient the mother says that the labor was easy and natural in every respect, and the child was well-developed and healthy. No swelling in the neck or abnormality was noticed at birth.

On examination the right sterno-mastoid muscle was seen to be contracted, both in its sternal and clavicular portions, but ill-defined from the fatness of the neck, and crossed at its clavicular attachment by a large vein.

Measurement of *right* sterno-mastoid along its posterior border . . . . . $2\frac{1}{2}$ inches.
Measurement of *left* sterno-mastoid along its posterior border . . . . . $3\frac{1}{4}$ "

Shortening *three-quarters* of an inch.

Treatment. I proposed to begin with extension of the head in the horizontal position, and ordered an extension couch, with the ordinary apparatus for head-extension. This was to be followed, as soon as the child could bear it, by head-extension in the standing position, using Prof. Sayre's apparatus. The horizontal extension to be used for two hours in the morning and one hour in the afternoon.

The daily routine to be as follows: The use of Sayre's head-extension at 9.15 A.M. for six or seven minutes. Then play for a quarter of an hour. Couch with horizontal extension for two hours. The couch to be used again for one hour in the afternoon, followed by the head-extension for six or seven minutes. During the rest of the time the little girl to wear a well-moulded and padded poroplastic felt-collar, to keep the head in a fairly straight position. This to be continued for two or three months.

February 1, 1894. There is evidence of a general improvement as to the position of the head, etc., and the right sterno-mastoid muscle is more prominent and better defined.

Measurement of *right* sterno-mastoid along its posterior border . . . . . 3 inches.
Measurement of *left* sterno-mastoid along its posterior border . . . . . $3\frac{1}{2}$ "

A gain of half an inch in about three months, allowing for growth.

March 7th. Measurements the same; asymmetry much less. The sterno-mastoid muscle is prominent and well defined, and the troublesome vein seems to have disappeared altogether. No objection now to the operation of dividing the sterno-mastoid being performed, and my colleague, Mr. J. Macready, who has closely studied all subcutaneous operations, agreed with me in this opinion, and, as my health was not good, I suggested he might perform it.

Now up to the present time the remarkable points in this case are:

1. The gain in the length of the contracted sterno-mastoid muscle of one-half to one-third inch in about three months under the head-extension treatment.

2. The increased prominence and definition of the affected muscle.
3. The alteration of position and direction of the vein or veins.
4. The marked decrease in the asymmetry of the face.
5. The early applicability of the treatment and its perfect tolerance by the young patients.

After this visit in March, 1894, I saw nothing more of my little patient till March, 1895. She belonged to a good German family, and the Germans in London usually pay a round of family visits in Berlin, etc., at the end of our summer. My little patient was therefore taken to Berlin, and, under the pressure of relatives, a distinguished surgeon of Berlin, Dr. Beely, was consulted. He approved the treatment, and saw at once how much had been gained already. He saw no objection to dividing the sterno-mastoid, and performed the operation subcutaneously in September, 1894. Dr. Beely advised all the previous treatment to be continued.

March 25, 1895. An immense improvement has taken place as regards the position of the head, the symmetrical condition of the features, etc.

Measurement of *right* sterno-mastoid along its posterior border	$3\frac{5}{8}$ inches.
Measurement of *left* sterno-mastoid along its posterior border	4 "

I saw the patient on several occasions and found the improvement well maintained. Before sending this paper to the Orthopedic Association I paid a special visit on April 19, 1896, and the improvement was still going on.

Measurement of *right* sterno-mastoid along its posterior border	$3\frac{3}{4}$ inches.
Measurement of *left* sterno-mastoid along its posterior border	4 "

This young lady, who will be five years old in May, still continues the head-extension treatment and the use of a collar at night and part of the day.

Now, Mr. President and gentlemen, I think you will agree with me that the success in this case is one that may well be shared by America, London, and Berlin, and I trust it may lead to many such successful cases in America.

FURTHER REMARKS ON CONGENITAL DISLOCATION OF THE HIP.

By BERNARD E. BRODHURST, F.R.C.S.,
LONDON.

In addition to the "Observations" which I presented to the Society at the last session, I wish to observe that congenital dislocations of the hip, as they are usually described, may be divided into several categories. And also, besides these classes, there is a form of rickets in which the neck of the femur forms a right angle with the shaft, and through which the trochanter is brought above Nélaton's line. This is not infrequently mistaken for congenital dislocation, and it is mistaken even by experts, who consider the position of the trochanter rather than that of the head of the femur. It is not an uncommon malformation, and it occasions a peculiar gait.

The various classes into which the subject may be divided are as follows, namely:

1. Dislocations which occur *in utero*.

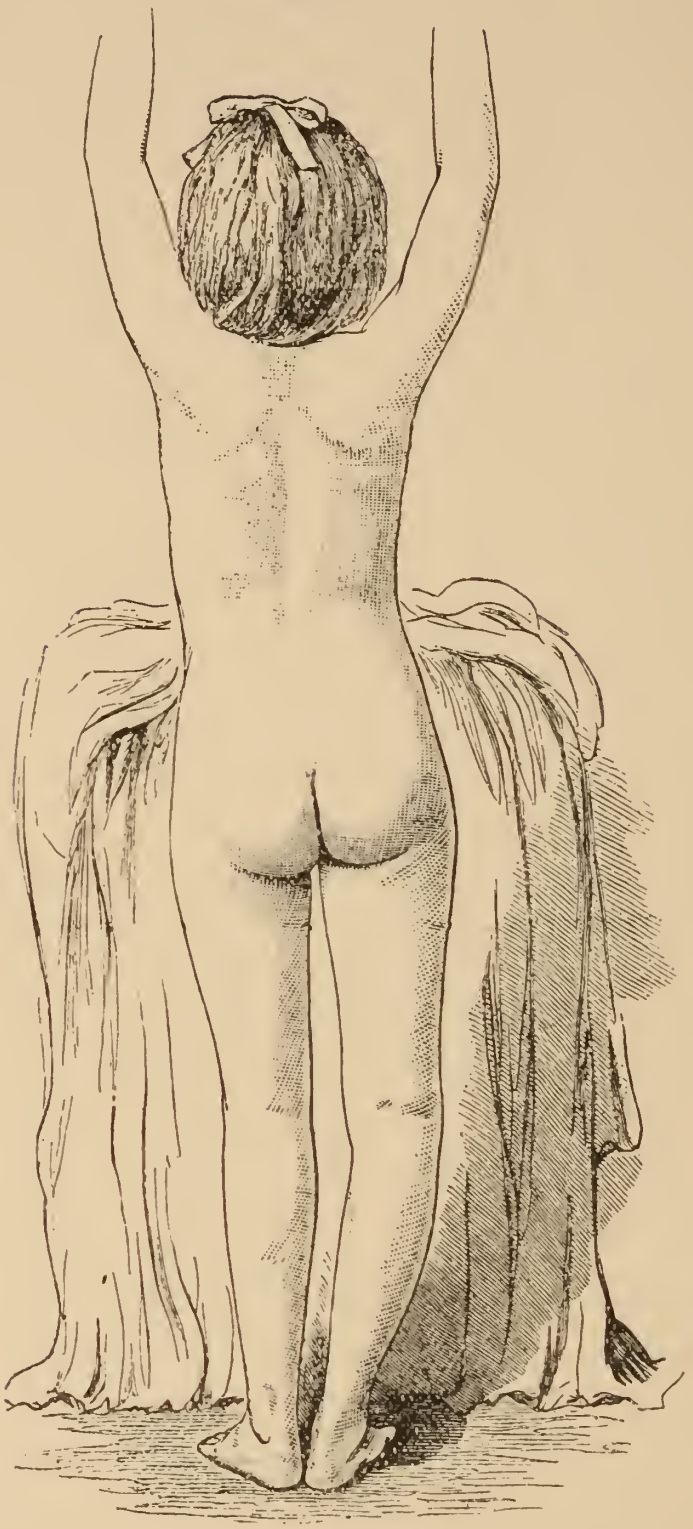
These displacements occur through shock; cause and effect may usually be traced. Thus I have known the shock of a gun accident to conduce to this dislocation. Also the fear occasioned by a railway collision has produced a similar effect. Again, a fall through the ice while skating, a fall in the hunting-field, and a fall through a window seem in each case to have been the primary cause of this dislocation. Spasmodic action was induced in each case, and it continued after birth. The result in such cases is that the head of the femur is drawn away from the acetabulum, and is placed higher up on the dorsum ilii than when dislocation is produced at birth. Also there may be conjoined with dislocation club-foot and club-hand, and

other deformities. Or, instead of dislocation, there may result fracture and distortion. In such cases development is incomplete.

2. Dislocations produced at birth through traction.

In such cases the femoral head is found immediately beyond the brim of the acetabulum; and it is only after the weight of the body has been borne on the feet that the head moves from this position. Then gradually it rises on the dorsum ilii, and the shortening of the limb is observed. When this dislocation is recognized early the head of the femur may be immediately restored to and be retained in the acetabulum; but when it remains displaced during several years changes take place, such as retraction of the muscles, filling up of the acetabulum, and some flattening of the head of the bone. These changes, however, are never so pronounced as those which are observed in the first series; for the parts are fully formed, so that neither is the femoral head so much flattened nor is muscular retraction so great; the acetabulum also is found to be fully developed. In this second series not only is development complete, but there is no other abnormality present.

When spasm exists, and when retraction has taken place, it is improbable that the femoral head can be restored to the acetabulum and be there retained except after section of the affected muscles. Further, the acetabulum is altered in shape and in depth, and it may be filled up with osseous matter. Paci recognizes that retraction of muscles takes place in all cases; and yet he endeavors to replace the femoral head in the acetabulum by extension only. He never succeeds, however, in retaining it there, but is obliged to fix the femoral head elsewhere than in the acetabulum. But it is of small use only to substitute one lameness for another—to produce, as his critic says, "claudication persistante." Paci does not divide the retracted muscles around the trochanter and the neck of the femur, nor the adductors, "puisque pour la rendre efficace il faudrait qu'elle fût appliquée à presque tous les muscles de la fesse et de la cuisse;" and therefore he prefers what he terms his *rational* treatment—"non sanglante;" the result of which is that the femoral head is drawn down to the cotyloid cavity, "so that one might believe the dislocation to be absolutely reduced." But he continues, "On ne l'obtient pas; mais la tête du fémur va se placer tout près de sa position normale et au-dessous de l'épine iliaque antéro-inférieure;



en d'autres cas enfin, on la peut conduire au-dessous et un peu en dehors de l'épine iliaque, de manière a simuler presque une variété de la luxation iliaque antérieure, ou de Monteggia."[1]

By extension only, as practised by Paci, there is left a short leg

[1] Revue d'Orthopédie, No. 5, p. 335.

—"un petit raccourcissement de 1 ou 2 centimètres et plus, dû surtout au défaut de développement squelettique, qu'il est impossible au chirurgien de compenser."

How different is it after the retracted muscles have been divided and the femoral head has been fixed in the acetabulum! Then, not only is the length of the limb perfect (for in these cases there is seldom any difference of length in the skeleton), but the joint motions—flexion, extension, abduction, and adduction—are perfect. Such was absolutely the case in the patient from whom the photograph was taken, and from which the accompanying woodcut was made.

Thus I contend that the femoral head should in every case be replaced in the acetabulum, and should never be left elsewhere.

After long experience both of simple extension and of replacement after section of muscles, I will affirm that I have never seen a case in which extension alone has been employed where displacement has not again taken place on remitting extension; and after such treatment I have always found displacement on examination, even after reported recovery.

3. Displacements which result from inflammation and destruction of the joint.

Inflammation of the joint may be occasioned through injury at birth, and before two months have elapsed suppuration will be established. Puffiness will be observed, and rapidly the epiphysis becomes inflamed; the joint is filled with pus, and the head and the neck of the femur may be wholly or in part destroyed. The head of the femur is dislocated; sometimes it is misshapen, and sometimes it is excavated; or, again, it is flattened or it remains a mere stump. Here, as a result of injury, acute arthritis proceeds to disorganization of the joint. Such cases are very commonly spoken of as congenital dislocations. I have seen hundreds of them.

4. Malformations and serious deformities, such as spina bifida, ectopium abdominis, club-foot and club-hand, fractures and dislocations.

Thus I would sum up this question as follows, namely:

1. Congenital dislocation of the hip induced by spasm *in utero*. One or both limbs may be affected, and the hands and feet may also be distorted. This is a result of violence or of mental excitement.

2. Displacements occurring at birth through traction.

3. Inflammatory disease producing displacement.

4. Malformations and dislocations occurring in the anencephalic and the hydrocephalic fœtus.

All of these classes are commonly spoken of, whether in museums or in life, as congenital dislocations. I would submit, however, that it is to the first class alone that this term should be applied. Both the second and the third series are due to violence after the parts are beyond the uterus; and the fourth class is for the most part for the museum. And, although it may not be possible to explain exactly the origin of every case, it is probable that with care a solution in accordance with the above formula may be arrived at.

CONGENITAL ANTERIOR DISPLACEMENT OF THE HIP.

By De FOREST WILLARD, M.D.,
PHILADELPHIA.

Anterior displacements of the head of the femur from congenital deformation of the acetabulum or the head and neck of the femur are quite rare, only two or three American cases having been reported, hence this record.

The patient was a boy, aged eleven years; third child. No history of injury at birth or later. Began to walk at one year of age, but parents are not positive as to whether they noticed any peculiarity of gait until he was three years of age. Gait at present is a decided limp, from shortening of the leg, but the waddle is not characteristic as seen in cases of posterior displacement. There is only a moderate amount of lordosis, since the position of the head of the bone does not necessitate marked accommodation of the spine.

Viewed anteriorly, two inches below the right anterior superior spinous process, and in a line with it, is a hard prominence which rotates in unison with all the movements of the femur. The neck of the bone can also be easily distinguished. The trochanter is more prominent than normal, and broadens the limb at this point. The head apparently lies upon the ilium directly above the normal position of the acetabulum; it does not slide during locomotion. Adduction and rotation can be performed to nearly the usual limits, but abduction is interfered with when the limit reaches 10° outside of the straight line. Flexion is normal; extension slightly limited. The head can be outlined without much difficulty, and the periarticular muscles all seem in good condition. The head does not lie upon the ramus of the pubes nor in the thyroid foramen, as ordinarily seen in anterior traumatic dislocations, but is directly above the socket.

Posteriorly, the right buttock is broadened and slightly flattened and the trochanter more prominent.

The boy can stand upon tip-toe on the right side, but the leg and thigh are slightly atrophied, being half an inch less in circumference. The distance from the anterior spinous process to the knee is one and a quarter inches shorter than the left when the leg is straight; but when the thigh is flexed to the right angle the knees are in line, owing to the upward position of the displacement. It is probable that the deformation consists in a false acetabulum above the site of the true one rather than that the acetabulum is oval in shape.

The motions of the femur nearly approximate the normal, and, as there is no sliding motion, shortening is practically the only deformity. It is difficult to see how any operative interference would be beneficial, since lordosis is slight, and the power of the muscles connecting the trunk with the femur would certainly be diminished by interference. Lengthening the limb artificially is all that is advisable. As this procedure corrects the limp, and the interference with locomotion is so moderate, it is difficult to see how a Hoffa or Lorenz operation would improve him.

I have seen a number of cases of variations in the hip articulation which have differed markedly from the typical condition of congenital dislocation. Some of them have very probably been from early fractures or dislocations or epiphyseal separations. In some cases the femoral neck has been shortened and even distorted and twisted, possibly coxa vara; while in other instances there has been an appearance of an old injury. In the majority of cases the injury has been unrecognized during infantile life, thus leaving the question of prenatal or puerperal injury uncertain. The first evidence of the condition has been the irregular gait which the child exhibited when commencing to walk; or, perhaps, the disability was not noticed until a year or two later. In the majority of cases the growth of the limb has been so altered that there has been a difference of from half an inch to two inches in length.

It is probable that although the condition has existed from birth the cause may have been traumatic even within the uterus. In this deformity, as in others, it is quite possible that violent coition during the first month of pregnancy may influence the embryonic

mass, especially if the ovum has become attached to the lower segment of the uterus.

When the head of the femur is fairly well confined in its excursive movements upon the ilium, diagnosis is sometimes difficult.

The diagnosis of anterior position of the head of the femur from acute bending of the neck of the femur, as described by Whitman,[1] is not difficult.

About the trochanter the conditions are similar. In misplacement, however, the head of the bone can be plainly distinguished in its abnormal position. Trochanteric rotation is altered. Bending of the neck may or may not be associated with rhachitic deformities; yet it must be due to some softening of the bone akin in character.

The trochanter in acute bending is above Nélaton's line, while in anterior displacement it would be both above and in front of its normal position. Mutter, of Germany, in 1889, first described this condition, as it usually occurs in children about the age of puberty, probably due to causes similar to those which produce lateral curvature. Leeser[2] states that rhachitic symptoms coexist.

Acute bending is most liable to occur in those who have heavy weights to carry or who are subjected to prolonged standing while in a debilitated condition; but there must be some local fault to cause the deformity, as it frequently occurs on one side. In dislocation there is usually a sliding of the head.

Drs. Ridlon and Phelps have both reported cases of anterior dislocations.

In Dr. Phelps's[3] case the child died of acute spinal meningitis one and a half years after treatment was commenced. The specimens showed that the case was one of congenital dislocation, probably *in utero*, with non-development of the acetabulum. Whether this occurred from traumatism or from some reflex spasm of the muscles caused by central nerve lesions in early fœtal life is uncertain. Ketch[4] does not believe that this condition is due to injuries at birth.

[1] Transactions of the American Orthopedic Association.
[2] Presse Médicale, October 5, 1895.
[3] Transactions American Orthopedic Association, vol. iv. p. 132.
[4] Keating's Enclycopædia of Diseases of Children.

In Phelps's case the head of the bone lay in front of its normal position. The leg was shorter than its fellow, the toes were rotated inward. The acetabulum was angular in shape, small, and undeveloped. Phelps enumerates a number of cases where this condition originated from defect in the organization of the germ, the result being arrest of development in the cotyloid cavity; also cases of intrauterine disease and diseases of the primary nerve-centres supposedly acting through the central motor apparatus and producing muscular spasm with resultant dislocation, but he discredits the latter hypothesis.

My own belief is that traumatism inflicted during delivery is not infrequently productive of fractures or dislocations to which the plastic anatomy of the infant adapts itself and gives only a moderate amount of subsequent deformity. In breech presentations a hook is frequently placed over the thigh of an infant and strong traction made upon the tissues; certainly sufficient to displace a bone or break the rim of the acetabulum.

The treatment proposed for these various congenital deformities is prolonged extension in bed, followed by the use of apparatus to continue extension, as recorded by Bradford,[1] the individual being kept under extension in all positions of the limb. For locomotion a long fixation splint may be used, or a joint locking and unlocking splint with leg and thigh envelopment.[2] The method of forcible manipulation during the process of extension probably produces a certain amount of adhesive inflammation.

In Ridlon's case[3] the head of the femur lay almost directly below the anterior iliac spine. The leg was shorter than its fellow. Forcible traction by Taylor's extension hip-splint was continued in bed for an entire year, after which the child walked upon a long traction splint, the shortening being reduced from three inches to half an inch, although at the time this case was reported continuous traction was still in force and no weight had been borne upon the limb.

In another case which I have recently seen (a girl, two years of age) the left leg is three-quarters of an inch shorter than the right

[1] TRANSACTIONS OF THE AMERICAN ORTHOPEDIC ASSOCIATION, vol. iv. p. 308.
[2] Philadelphia Medical Times, November, 1880.
[3] TRANSACTIONS OF THE AMERICAN ORTHOPEDIC ASSOCIATION, vol. ii, p. 76, 1889.

one, and she walks with a decided limp. The head is freely movable upon the ilium nearly an inch in an upward direction. The trochanter is prominent, but is not displaced backward. The head of the bone can be distinctly outlined, apparently lying upward and slightly forward.

CURE OF CONGENITAL LUXATION OF THE HIP BY BLOODLESS REDUCTION AND WEIGHTING.

By ADOLPH LORENZ, M.D.,
VIENNA.

Even if we have finally succeeded in curing the congenital dislocation of the hip by operative means, we cannot yet consider the aim of our endeavors attained, for this can only be when an ideal cure with complete preservation of the integrity of the joint-constituents has been made possible—an ideal which can only be attained by bloodless means.

After my experience only very young children, up to at most the end of the sixth or the seventh year, can be subjected to the bloodless treatment with prospect of success. Beyond this limit of age, even past ten years, one may obtain repositions of the head, but in the majority of cases the acetabulum is too small and the plasticity of the tissue diminished. It then becomes much more difficult to enlarge the acetabulum and to fix the head within it.

For those older children, and for those cases in which especially unfavorable anatomical conditions are present, the operative treatment will therefore remain the only possible means of cure. The previous trials of bloodless treatment necessarily failed, as too little regard had been paid to pathologico-anatomical conditions. A bloodless method can only have prospect of success when it adopts the hundredfold confirmed indications of the operative treatment and makes them its own. The judicious mode of fulfilment of these indications must be strictly adapted to the pathologico-anatomical conditions of the luxated joint. In other words, only such a bloodless method can have a prospect of success which has immediately arisen from the approved bloody method. In the course of the last three years I have performed more than two hundred

operative repositions on congenitally luxated hip-joints, and have never omitted to examine in every case the feasibility of the bloodless treatment, and to search for the appropriate way and method of the fulfilment of the indications. On these reduction experiments *on the operatively opened hip-joint* I have based my new method of the bloodless treatment.

The preliminary condition absolutely necessary for the success of my method, to place the head into the acetabulum, is the following: *the head must first be pulled down by extension to the level of the acetabulum.*

In younger children the experiment of the operative reduction has shown that it is quite possible to pull down the head of the femur to the level of the acetabulum by manual extension or with the aid of the extension screw without opening the joint capsule and without injuring a muscle. In each of these cases the attempt was made to drive or press into the rudimentary acetabulum the head of the femur.

To understand the difficulties and obstacles which offer themselves to the driving of the head of the femur into the rudimentary acetabulum, we must picture to ourselves the pathological conditions. I think that I do not need to emphasize the fact that between the acetabulum of a normal and of a congenitally luxated hip-joint there is only a distant analogy. The normal acetabulum is a hollow ball; its posterior half is the bony hollow ball, on the anterior and outer surface of the pelvis, the acetabulum proper; the anterior half of the hollow ball is formed by the joint capsule which adapts itself to the rounding of the head of the femur. Entirely different are the conditions in the congenitally luxated hip-joint. The bony hollow ball has become a small flat disk which is bounded by a very low and hardly projecting rim. The volume of the bony ball is also much diminished. The anterior half of the normal hollow ball which is formed by the capsule has lost its volume entirely, for the immensely thickened capsule overlies the bony surface of the acetabulum. The hollow ball of the normal acetabulum, which, as the negative of the head ball, forms an accurately fitting case for the head of the femur, has been transformed into a pocket, the walls of which touch each other. This cleft-like space which lodges some fat-tissue and occasionally the ligamentum teres I have designated

by the name acetabulum pocket (pfannen-tasche). It resembles the pockets which are placed on the inside of a carriage. The acetabulum pocket extends in an approximately frontal direction from without inward, and communicates with the sheath which is formed by the capsule of the dislocated hip-joint by means of a lateral, more or less cleft-like entrance. This entrance to the acetábulum pocket is further narrowed by the tendon of the ilio-psoas muscle which is laid around the sheath of the capsule in a sling-like form.

Into this cleft of the acetabulum pocket the head of the femur must be pressed. It is easy to see why this attempt frequently failed; it is also questionable whether the anterior fibrous wall of the acetabulum pocket is sufficiently distensible. In case it is stiff and unyielding the attempt to drive in the head of the femur may fail. This has been shown in the trials of reduction attending the open operations. When the capsule did not allow of sufficient dilatation by the head pressing against it, the trials were futile. When now the capsule (the anterior wall of the acetabulum pocket) was split with the knife it was evident that the head of the femur could be placed on the surface of the bony acetabulum, without, however, finding there a solid resting-place. In very young children in the third or fourth year, it appeared that the head of the femur could not only be pulled down into the level of the acetabulum without great trouble, but could by appropriate manœuvres be driven into the acetabulum pocket, *whereupon it jumped over the posterior rim of the bony acetabulum with a plain noise and an equally plain shock of the body.*

In these experiments the important fact was established that successful reduction was only stable with very considerable abduction of the femur, amounting to almost ninety degrees; with the diminution of this abduction reluxation occurred immediately, long before a position of the limb had been obtained, which would have been the least appropriate for the function.

The experiments therefore showed that under the given pathological conditions the forced reduction was first extremely unstable and absolutely irreconcilable with a half-way normal position of the leg. It remained to solve the difficult problem of making stable such an unstable reduction. In the operation this is done by deepening the too shallow acetabulum by means of a sharp spoon,

but the bloodless treatment does not allow of this transformation of the inadequate resting-place of the acetabulum, and other means and ways must be used to attain the desired end.

As regards the choice of these means the experiment could give no information, but this question was only to be solved by the clinical experience.

Why, then, is the reduction obtained by bloodless means unstable, and why is it stable only with extreme abduction? The answers to these questions follow when one opens the capsule in the operation and tries to mortise the head of the femur into the intact rudimentary acetabulum. It is shown that it finds only very uncertain support, because the surface of the acetabulum is nearly flat, and besides much too small, while the posterior rim of the acetabulum being entirely flat cannot oppose a sufficient barrier to the large and irregularly formed head of the femur. The relative disproportion between the head of the femur and the bony acetabulum which exists under all circumstances is also the most important cause of the unstability of the obtained reduction. As the acetabulum does not roof in the head of the femur with its posterior rim, it can only find the necessary resistance on the posterior wall of the acetabulum with strong abduction of the leg. The disproportion between the joint-elements must evidently be much greater with an intact capsule, as a too narrow and stiff acetabulum pocket scarcely allows the entrance of the head of the femur, far from offering it a solid resting-place.

These clinical facts raise distrust of those pretended successes in reposition in which the stability of the reduction is said to result immediately with a normal position of the limb.

Based on these experiments and experiences, I laid out a plan of the bloodless treatment of the congenital dislocation of the hip which I outlined in my book on *The Pathology and Therapeutics of the Congenital Dislocation of the Hip* (Vienna: Urban & Schwarzenburg, 1895), as well as in No. 7 of the *Centralblatt für Chirurgie*, 1895. Soon I was able to report successful cases, and in No. 33 of the same journal I annexed my methods to those in practice. How properly the original plan was outlined is shown by the fact that the practical experience has only made necessary immaterial changes. The task now presents itself of describing my method somewhat more in detail than has been done so far (*loc. cit.*).

The indications for the bloodless treatment are identical with those of the operative treatment, viz.: *first, to bring down the dislocated head of the femur to the level of the acetabulum* (reduction); second, to enlarge the rudimentary acetabulum (acetabulum formation); third, to implant the head of the femur into the artificially dilated acetabulum (reposition); fourth, restitution of the mobility of the joint and of the muscle-power (restitution).

These indications, however, cannot, in the bloodless method, be carried out in the same order as in the operative; while in the latter case the formation of the acetabulum precedes the act of reposition of the head of the femur, the brought-down head of the femur must in the bloodless method be immediately implanted in the rudimentary acetabulum; the formation of the acetabulum must consequently follow the reposition, and herein lies the main difficulty of the whole undertaking.

The indications named must be followed in the given order, because the fulfilment of each step is always indispensable to the success of the next. This is done in the following way:

1. The bringing down of the head of the femur (reduction). This task is, in the bloodless method, far more difficult to accomplish than in the operative reduction, because the resistance of the muscles as well as of the capsule must be overcome by simple extension. Obviously, anæsthesia is necessary to bring the muscles to complete relaxation. The extension is made manually by slinging a long woollen cloth around the ankle, while for counter-extension a perineal sling is used. The extremity is now subjected to gradually increasing and finally very strong traction. Should difficulties arise, the extension screw is applied, which is illustrated in my book above cited. By means of this instrument one can exert an adjustable, easily regulated, and, if necessary, very powerful traction without personal effort or fatigue, and without doing any harm to the patient. The traction must be applied slowly to allow time, so to speak, for the soft parts to elongate and to yield to the power of extension. *The extended leg places itself in abduction spontaneously*, which is the more desirable, as in this way the greatly shortened adductors are exposed to a more powerful traction. The reduction may be considered successful if the tip of the great trochanter is placed in, or, better, somewhat below Nélaton's line. One may assure one's self

of the successful reduction also by taking the head of the femur between the fingers and establishing its relative position to the anterior inferior spine.

The anatomical condition of the elements of the joint is as follows: By the extension combined with the abduction, the anterior fibrous wall of the acetabulum pocket is put on the stretch and lies firmly over the bony acetabulum. The volume of the acetabulum pocket consequently equals zero in this position of the limb. The entrance to the acetabulum pocket is still more impervious than under ordinary circumstances. The head of the femur stands in the level of the acetabulum, that is, below the anterior superior spine, but it is displaced laterally and is situated fairly well externally to the anterior inferior spine. As the head of the femur is normally somewhat turned forward, and this turning forward (anteversion) is frequently increased when luxation is present, it stands, especially if there is additional outward rotation of the leg, almost in a sagittal plane. As the acetabulum pocket is situated in an almost frontal direction, it follows that the head of the femur in this position is turned away from the entrance to the acetabulum pocket. *The successful bringing down of the head of the femur is, as has been stated, necessary to the success of the following act.*

2. Implantation of the head of the femur into the rudimentary acetabulum (reposition). The disproportion existing between the head of the femur and the volume of the acetabulum pocket can first be only somewhat diminished by dilatation of its fibrous part, that is, by stretching of the anterior yielding wall of the acetabulum pocket. This dilatation can only be accomplished by the head of the femur itself. To render its driving into the acetabulum pocket possible, two conditions must in the first place be fulfilled: 1. The entrance to the acetabulum pocket must be made passable. This is done by flexion of the femur to the right angle. By this means the capsule is relaxed and the head placed behind the posterior rim of the acetabulum, over which it is to be forced to spring immediately afterward. The relaxation of the muscles does not come into consideration, as a sufficient elongation of them has been already obtained by the preceding extension. 2. The head of the femur turned away from the entrance to the acetabulum pocket must be turned toward it. To this end corresponds a frontal position of the head of the

femur as the acetabulum pocket extends in a frontal direction. As the femur is in a flexed position, it must be rotated slightly inward to cause a frontal direction of the head of the femur. Now the head of the femur is in the proper position which allows of its being driven into the acetabulum pocket. To attain this the extremity is gradually with great care (to avoid a fracture) more and more strongly abducted TILL AN ALMOST RIGHT-ANGLED ABDUCTION IS OBTAINED. During these efforts the head of the femur is grasped with the fingers, and one tries to direct it against the posterior rim of the rudimentary acetabulum in order to force it to finally jump over this rim by increased abduction. This event, the reposition proper, occurs under classical acoustic and palpatory phenomena. The jumping over by the head of the femur of the posterior rim of the acetabulum produces a fairly loud reduction noise which can be compared with the hollow beat of a drum. By the resonance of the air-containing body-cavities this noise is intensified and is sometimes so loud that it cannot escape the most careless observer. In the same moment all hands which are in contact with the body of the patient feel a distinct jerky concussion, and in the same moment the femur becomes visibly longer. If the abduction is diminished, there ensues immediately the reluxation under the same phenomena; while renewed increased abduction causes in the same previously accurately determinable moment exactly the same acoustic and palpatory phenomena. The obtained reposition is therefore of very great unstability, as it otherwise is not possible or to be expected from the pathological conditions. The point is to convert this unstable reduction into a stable one. This primarily happens through the immediate, and, in course of time, through the mediate enlargement of the acetabulum.

Acetabulum formation. The immediate acetabulum formation, that is, the immediate dilatation of the acetabulum pocket, happens by stretching of its fibrous anterior wall. For this purpose the femur abducted at a right angle is driven into the acetabulum pocket in mesial direction with gradually increasing and finally very great force. By external rotation of the head of the femur and by gradual hyperextension the anterior fibrous wall of the acetabulum pocket is exposed to a very considerable strain. After long-continued efforts it is shown that the unstability of the reduction is already somewhat diminished. Reluxation does not, as immediately

previous, follow the slightest jar. But the stability of the reduction is by no means reconcilable with even a half-way normal position of the leg. The more one diminishes the abduction the more unstable becomes the reposition. Frequently enough one cannot deviate much from the right-angled abduction without causing reluxation. The resultant unstable reposition can only become stable in course of time.

One determines now in careful and oft-repeated trials the degree of abduction in which the reposition is still securely stable, and fixes the somewhat hyperextended and slightly outward rotated extremity at the hip in this ascertained degree of abduction, or still better in a greater one, by means of an exact plaster-of-Paris bandage, which allows of free mobility of the knee-joint. Now the anæsthesia is stopped. In case the necessary degree of abduction is very considerable one puts under the calf of the affected side, flexed at the knee, a correspondingly high prothesis in order that the standing and walking of the patient is at least rendered possible with support.

In case the reposition remains stable with somewhat diminished abduction, the foot of the sound side is provided with a high sole, so that a fairly considerable apparent lengthening of the abducted leg is thereby compensated for, and the patient is enabled from the beginning to stand and walk more comfortably. This, however, is only allowable in favorable cases. As a rule it is necessary to fix the reduced limb for twelve weeks and even longer in extreme abduction. When this first fixation period is over, during which the child can stand and walk poorly, at least can be carried and driven out, the abduction can be somewhat diminished without reluxation following. The reposition has become more stable. With the diminished degree of abduction of the reduced limb, its apparent lengthening hereby necessitated can easily be equalized by a high sole under the well foot. The independent walking and standing of the child have become quite possible. It is in the plan of the treatment that the patient should be on his feet as much as possible, standing or walking the whole day. Hereby the reduced head of the femur is put under the pressure of the body-weight, and this consequently in the service of the therapeutics. *In virtue of the utilization of the body-weight for the purpose of making the reposition stable, my method is principally characterized.* In what way

now does the making stable of the reduction occur? The answer is, by the mediate acetabulum formation which results without our direct assistance if only the head of the femur retains its position in the rudimentary acetabulum.

By what means can the situation of the head of the femur in its new position be secured? 1. By the preliminary retaining of a more or less extreme abduction of the hyperextended and moderately outward rotated extremity. 2. By the putting on the stretch of all shortened muscles, the elasticity of which was aroused by overcoming the resistance offered by them in the moment of reposition. *This muscle-resistance which had to be overcome in bringing down the head of the femur into the level of the acetabulum is rendered serviceable to the purpose of acetabulum formation.* 3. By the weight of the body, which presses the head of the abducted femur with every step more firmly against the acetabulum, or rather into the acetabulum pocket. The patient with every step forces the head of the femur more deeply into its new resting-place.

In what way now does the deepening of the shallow bony acetabulum occur? I believe that the head of the femur when it is forced to remain in one and the same place in the rudimentary acetabulum must exert its influence on the direction of the active processes of growth in the epiphyseal cross of the bottom of the acetabulum. As long as the head of the femur is external to the acetabulum these processes of growth have, so to speak, no aim and no direction, but mainly go to waste in a formless thickening of the bottom of the acetabulum, whereby the capacity of the acetabulum itself becomes less and less. From the moment of the permanent presence of the head of the femur in the rudimentary acetabulum these conditions change. The processes of growth in the bottom of the acetabulum are forced to assume aim and direction by the presence of the head of the femur. The acetabulum is, in other words, forced to grow around the head of the femur, to change in this way to a (dense-shelled) solid hollow bowl and to fix the intruder.

The presence of the head of the femur in the rudimentary acetabulum, *i. e.*, the successful reposition, is, therefore, the indispensable presupposition for the possibility of the acetabulum formation. The fulfilment of the preceding indication remains always the condition *sine qua non* for the success of the following.

It would be irrational, nay unallowable, to fix the extremity in extreme abduction without being perfectly sure of the successful reposition. If it appears on reposition that it is impossible to drive the head of the femur into the acetabulum pocket, or if it does not find sufficiently strong support, it is better to interrupt the trial and not to renew it. The child has not sustained the least harm by the futile trial. After two of the three fixation-periods with gradually diminished abduction it is shown that the stability of the reposition has so much increased that for the compensation of the resulting apparent lengthening of the abducted diseased limb a sole under the sound foot of 2 to 3 cm. in height suffices. In general with somewhat favorable anatomical conditions this is the case after half a year's fixation. During this period the active liberty of movement of the patient has only been interrupted a very short time, and this short interruption is made good by the prescribed increase and augmentation of the function of the limb by diligent walking and standing during the later fixation-periods.

Restitution. After the stability of the reduction has become sufficiently established, and even with very limited abduction, no reluxation of the head of the femur occurs, the fixation of the joint is ended, and the child is now trained in perfect liberty, without the use of any mechanical apparatus. The only contrivance which is still used for securing the stability of the reposition is of imposing simplicity, it is the 2 to 3 cm. high sole under the well foot.

To the restitution is assigned the task of restoring the mobility of the joint. This does not cause great trouble and is effected almost spontaneously. The bloodless reposition has made no scars like the operative reduction. There are lacking, therefore, the impediments to mobility, and equally the danger of subsequent contracture-position of the joint by scars is avoided.

It is known that the operative reposition requires a very laborious after-treatment lasting for years, which has the purpose of restoring the mobility of the reduced joint and to prevent false positions of it (adduction and flexion). Every operator who shuns this task, laborious and requiring great sacrifice, will experience the most lamentable failures with his operative repositions.

This unpleasant task is of small proportion after the bloodless repositions. The mobility is restored spontaneously, and contrac-

tures are entirely obviated. The usual tedium of the mechanical methods of treatment in orthopedics is a sufficiently well-known fact. Here, however, we have to note an exception, for the bloodless treatment of the congenital dislocation of the hip requires a shorter time than the operative method, on account of the great simplicity of the after-treatment. It is to be recommended that in the care for the mobility the flexion and extension exercises should always be combined with slight abduction. Of greatest importance is the care of the pelvic trochanteric muscles, by duplicated abduction exercises with gradually increasing resistance. Exercises in standing on the reduced leg are commendable while the sound side of the pelvis is lifted up. By this exercise the gluteal muscles of the diseased side must be called upon for very powerful action.

A set of strong gluteal muscles is the best guard for the stability of the reposition, for by means of the resultant power of these muscles the head of the femur is pressed against its resting-place. On trying to bring the abduction, which is still present, to an entirely indifferent extended position of the limb (which is to be done carefully), one feels plainly the reflex resistance of the gluteal muscles which resist the continuation of the movement beyond the median line toward the side of adduction. It is a demand of caution to retain the high sole under the well foot for a long time in order to secure the easy abduction of the reduced joint.

The diagnosis of the stable reposition is easily made according to the following points: Primarily the elongation of the reduced limb is very conspicuous. This is greater than after the operative reposition, as in the latter case the acetabulum is considerably deepened and its posterior superior rim is (not rarely) removed to some extent. If the neck of the femur shows even a semi-normal development, the bloodless reduction will produce an entire equalization of the length of the limb. At all events the remaining shortening is far less than after the operative reposition, and only amounts to a few millimetres. Correspondingly the tip of the trochanter is either in Nélaton's line or only a few millimetres above it. Above the trochanter one feels the bony wall of the outer surface of the ilium, while before the reposition one could demonstrate there plainly the head of the femur. The inguinal fold has become fuller, and frequently one can see about midway between the symphysis and the

anterior superior spine a circumscribed prominence and demonstrate beneath it a hard rounded body; the head of the femur which moves on, rotating the leg, and especially on outward rotation, enables one to recognize the characteristic anterior border of the formerly luxated caput femoris. It is of the greatest importance to emphasize that the firmly reduced head of the femur must not only be below but also fairly well inward from the anterior superior spine. The pelvis must have an absolutely normal configuration. This half of the pelvis may show slight atrophy, but its contour must remain entirely parallel to the normal contour; especially the broadening and flattening of the half of the pelvis must have disappeared. On taking a bird's-eye view of the pelvis, one can judge of the reposition of the head of the femur by comparing their form alone.

As regards the practical results obtained by my method, they are still incomplete and far from their conclusion. Nevertheless, I believe I am justified in inviting my esteemed American colleagues to try my method, and I here add a few practical hints to warn against mistakes. Whether a given case is suitable for the bloodless reduction or not, the examination can give some information, but the decision rests upon the trial of reposition. *Above all, it must be possible to bring down the head of the femur sufficiently low. This is the indispensable presupposition of the reposition.* The head of the femur must be well-preserved and especially not much flattened. The longer the neck of the femur the better the prospects. A normal direction of it is required. Cases with primarily defective or very much worn or deformed head of the femur, as well as strong or even sagittal anteversion, are not suitable for the bloodless reposition.

About the acetabulum the primary examination of the case can give no information at all. One succeeds without great difficulty under anæsthesia in the reposition by means of the head of the femur, which is used as a sound, so to speak, in palpating the immediate vicinity of the acetabulum as well as the acetabulum itself, and in obtaining hereby information about its capacity and its margins. In children of suitable age one can hardly ever fail in driving the head of the femur over the posterior rim of the acetabulum, and in producing hereby the reduction noise and the reduction concussion. One may, however, fail in driving the head of the femur sufficiently deeply into the acetabulum, so that he finds a half-way adequate sup-

port. This will only occur if the acetabulum is absolutely too narrow, the anterior wall of the capsule not sufficiently yielding or the head and neck of the femur too little developed, that is, too little projecting mesially.

In such a case the reduction could only be stable in extreme abduction of 90° and more, and, on account of the small prospect of definite success, it would be commendable in such a case not to continue the plan of further treatment, that is, not to fix the reduced limb. *The reposition trial in such a case had the significance of examination of the acetabulum under anæsthesia* without having done the least harm to the child.

As regards the possibility or the probability of success of the bloodless reduction, I have had the following experiences: In the past year(1895–'96) I have had occasion to try my reposition method in above 100 luxated hip-joints, and not a single time have I failed to obtain an indubitable reposition. In every case the reduction noise and the reduction concussion were plainly apparent, and every time the head of the femur could be demonstrated with the greatest certainty in its normal place in the flexure of the groin. This fact is the more remarkable as I was not at all particular in the selection of the cases for the reduction trials, as it was primarily the point for me to know whether reduction in this way could succeed at all. The oldest child with bilateral luxation with whom I succeeded with the bloodless reposition was in the twelfth year. The youngest child was in the second, the others in the third, fourth, and fifth year, etc. Only in my earlier cases did I meet with some failures.

As the success in this interrupted series of repositions cannot possibly be accidental, I believe I am justified in proposing the following: Presupposing half-way favorable anatomical conditions of the joint-elements, the bloodless reposition of the dislocation of the hip is possible up to about ten years. I do not need to emphasize especially that the successful reposition which under the given anatomical conditions at first is stable only with very considerable abduction, and not compatible with the function of the extremity, does not signify cure. We can only then speak of cure when the successful reposition remains stable with an indifferent position of the extremity. *But it seems very proper to call especial attention to the fact that only a doubtlessly successful reposition, no matter*

with what position of the extremity this is primarily stable, is the absolutely necessary presupposition and the only rational foundation of any further therapy. If the reposition has at all succeeded, its making stable even with an indifferent position of the extremity seems to me to be only a question of patience and necessary endurance. In favorable cases the stability of the reposition with indifferent position of the leg was obtained after six to eight months' fixation. During almost all of this time the patients could move about freely and use the reduced leg directly for standing and walking. If more difficult cases should require a longer fixation, this necessity will be more easily borne as the children do not suffer pain nor are hindered in their free locomotion. The greatest possible use of the reduced leg for standing and walking is desirable and must also be demanded.

Before I conclude my communication and illustrate the success of my method by some cured cases, it seems necessary to me to set forth those points by which my method is characterized.

1. My method is a strictly surgical one; that means it is executed from beginning to end with the most perfect instrument, " the hand."

2. Its indications are exactly identical with those of the operative method.

3. The proper conformance to these indications has been deduced from the reduction experiments attending the operative reposition and founded by these.

4. These indications are conformed to in a definite order, as the fulfilment of the preceding indication is the absolute presupposition for the success of the following.

5. The indications of my method can be divided into three groups, to wit:

a. Indications before the reposition.

b. Indications of the reposition itself.

c. Indications after successful reposition.

These indications differing from each other, nay, opposed to each other, are conformed to with different means which are also respectively opposed to each other. Extension corresponds to the indication before the reposition. The indications of the reposition itself are conformed to by the described manœuvre which can only be executed by the trained hand guided by anatomical intuition, and never

by the instinct of a mechanical apparatus. The indications after successful reposition are diametrically opposed to those before the reposition. Everyone must see that the extension is the most perverted means for fixing the reduced head of the femur in the rudimentary acetabulum. Just the opposite means, namely, the weighting of the reduced head of the femur with the body-weight, can serve this purpose.

Nearest related is my method to that of Paci. The differences and contrasts between the two methods are self-evident from what has been said so far. Nevertheless it seems to me imperative to speak somewhat more in detail of the relation of the two methods.

I again call attention to the fact that my indications are divided into three groups, to wit: those before, during, and after the reposition. Of these three groups merely the middle one has something in common with Paci's method, viz., the flexion of the thigh. But even with regard to this flexion there is a great difference between the two methods. Paci's flexion is extreme. On the contrary, the flexion prescribed by my method reaches only a right-angle. The intention of Paci's extreme flexion is to pull down the head; then the extreme flexion is used as an *equivalent* to the instrumental extension by the screw.

My right-angle flexion has quite another aim, viz., to relax the anterior wall of the capsule and to put the head of the femur *behind* the posterior rim of the acetabulum, over which it is obliged to spring by extreme abduction.

I have often tried in the operative repositions, before as well as after opening the capsule, to execute the four movements of Paci (extreme flexion, slight abduction to 15°—rotation out and extension), and hereby could accurately follow the movements imparted to the head of the femur. A real reduction I have never obtained with it for the following reasons:

1. The flexion is an absolutely inadequate means of bringing the head of the femur sufficiently far down. *This can only be obtained by the most powerful extension.* Flexion rather serves to relax the anterior wall of the capsule, to make accessible the acetabulum pocket, and to put the head in the right position to spring over the posterior rim of the acetabulum.

2. An abduction of slight degree is entirely insufficient to force

the head of the femur to jump over the posterior rim of the acetabulum. *This needs an abduction which amounts to* 90°.

3. With the movement of extension the head of the femur moves upward again from the acetabulum. By Paci's manœuvres, therefore, the head of the femur can be brought in the beginning into closer proximity to the acetabulum; in the end, however, it is again dislocated upward from the acetabulum for a greater distance.

Stress, however, must be laid upon the fact that Paci in different places in his publications denies the possibility of real repositions, which have been performed in Germany many hundred times; that he denies the possibility of pulling down the dislocated head by manual or instrumental (screw) extension; that he denies the possibility of performing an abduction of 90°; that he denies the possibility of producing the reposition-phenomena (noise and succussion) above described. *If he declares my method impossible to execute, then it cannot be identified with his method, nor can he claim the priority to have first performed what he himself claims as impossible.*

The aim of my method is not to procure a nearthrosis as near as possible to the acetabulum and to put the head in a better position, but to *re-establish* the original acetabulum itself, that is, *to put in action* the hip-joint itself. *My method does not aim to reach a "surrogate" of the hip-joint, but to restore the normal original hip-joint itself. Its character is not a palliative, but a radical one.*

The reposition manœuvres of my method are not at all adapted to the recent traumatic luxation, but they depend strictly on the pathologico-anatomical conditions of the congenitally luxated hip-joint. With these, however, a stable reduction with indifferent position of the leg is even with little abduction primarily absolutely irreconcilable. A stable reduction rather is primarily only possible with strong, nay, extreme, abduction of the leg.

For this reason it is necessary to retain that degree of abduction in which the reposition is still securely stable, and only later gradually and by steps to diminish the abduction in the same measure in which the formation of the acetabulum has progressed under the influence of the reduced head of the femur. While, therefore, Paci's manœuvres are executed in succession in the same sitting, the manœuvres in my method extend over a space of time of at least

half a year, and even far beyond this. While the method of Paci is satisfied to bring the head of the femur into closer proximity to the acetabulum, the execution and the further prosecution of my method has the doubtlessly secure reposition for its indispensable presupposition. Where this secure reposition has not been attained and the head of the femur only been brought into closer proximity to the acetabulum, the further prosecution of my method is of no use.

As regards, finally, the indications of my method after accomplishing reposition of the head of the femur they are diametrically opposed to those of the method of Paci. While Paci after accomplishment of his reduction manœuvres subjects the extremity to a strong extension, lasting months, and prohibits the weighting of the leg for at least one year, my method, in strong contrast to this, demands the immediate, continued, and most extensive weighting of the leg, that is, the most important function of the reduced head of the femur under the body-weight.

Finally, I shall briefly report some cases, the treatment of which, according to my method, has entirely or nearly expired:

Sophie Schnee Czernowitz Galizien, three and a half years old; right-sided congenital dislocation of the hip, 2 cm. shortening; the joint apparatus lax; the head of the femur somewhat flattened, but otherwise well developed; also considerable mobility, gait very poor and uncertain, limping well pronounced and striking. Bloodless reposition on March 6, 1895; the reduction noise and the reduction concussion classically pronounced; stability of the reduction was only obtainable with abduction almost to a right angle and simultaneous slight hyperextension, fixation of the leg in this position by a plaster-of-Paris bandage allowing the free mobility of the knee-joint. After eight weeks the abduction could be diminished to a 5 cm. support under the well foot without reluxation. From this time an independent standing and walking were unimpeded. The second fixation-period lasted again eight weeks. During the third and last fixation-period lasting ten weeks, the abduction without reluxation could be so much diminished that it was entirely compensated for by a sole of 2 cm. under the well foot. The fixation treatment after the reposition had therefore taken six months. During the last four months the child could move freely and load the reduced

leg with the body-weight. Only during the first two months the child could not walk, and was not confined to the bed, but could be carried in the open air. After six months' training in complete freedom, without any bandage, the reposition remained absolutely stable; massage and abduction exercises, with offered resistance; standing exercises on the reduced leg, while the other half of the pelvis is being lifted up.

Status præsens in the demonstration before the session of the Royal Imperial Association of Physicians in Vienna, January 31, 1896: The form of the two halves of the pelvis entirely identical, the gluteal folds symmetrical, and no trace of scoliosis or lordosis of the lumbar segment. The inguinal fold symmetrical, the right one a little fuller than the left. The tip of the trochanter lies just in Nélaton's line, a shortening not certainly demonstrable. If present it can at most amount to but 1 mm. The head of the femur is in the inguinal fold about midway between symphysis and anterior superior spine, easily felt on rotating as a bony hard tumor, even perceived with the eye as a slight prominence in the inguinal flexure on strong outward rotation of the limb. Behind the tip of the trochanter the palpating finger meets immediately the bony surface of the ilium. Against adduction movements the child resists by reflex action of the gluteal muscles. A thrust with the femur against the pelvis in the line of the axis of the femur meets rigid bony resistance. The mobility of the joint as regards abduction, flexion, and extension is perfectly free. The child stands with elevated left half of the pelvis with ease on the reduced leg, runs, dances, jumps, and walks without a trace of the limping previously so marked. Notwithstanding the brief duration of the treatment, the cure in this case can almost be called an ideal one.

Schwab, Richard, aged three years, Vienna; right-sided typical congenital luxation of the hip. Bloodless reposition under plain reduction phenomena, April 30, 1895. The stability required almost right-angled abduction with slight hyperextension. 1. Fixation-period in this position eight weeks. 2. Fixation-period with 4 cm. abduction (*i. e.*, for the compensation of the abduction, lengthening of the reduced leg, a sole under the well foot 4 cm. high was necessary) for three months, with perfect capability of motion of the patient. From the sixth month after the commencement of the re-

position, training in freedom; abduction exercises and massage; retaining of 2 cm. abduction.

Status præsens in the demonstration before the session of the Royal Imperial Association of Physicians in Vienna, January 31, 1896: Form of the pelvis normal, the head of the femur seen and felt in the inguinal flexure, apparent abduction, lengthening of 2 cm.; real shortening not demonstrable. Tip of trochanter in Nélaton's line. Mobility perfectly free. Flexion and extension always combined with some abduction. The limping, formerly so pronounced, almost absent and, so far as it is present, merely conditioned by the still existing abduction. The reposition stable without fault. The case has later proved a full success.

Of interest is a further case which seems particularly well adapted to illustrate what my method is capable of accomplishing. The little patient, Elsa Rudenberg, from Hungarian-Altenburg, with right-sided congenital dislocation of the hip, approaches the end of the fifth year. The prognosis of the bloodless reposition seemed to me a very doubtful one, because of the age of the child, and the rigidity and shortening of 3 cm. present, notwithstanding the proper formation and normal direction of the head of the femur. The parents were prepared for the operative reduction, and had given their consent to the operation. All preparations had been made. As in every half-way suitable case, I tried the bloodless reposition. The head of the femur was brought down by means of the extension screw and the reposition typically executed. The physical reduction phenomena were plainly pronounced. After diligent and direct dilatation of the acetabulum pocket by means of strong mesially directed impact of the femur, I was most agreeably surprised by the fact that the reposition remained immediately perfectly stable, with an abduction of only 4 cm.

We could note the remarkable fact that the child on the evening of the day of the reposition, when it had recovered from the anæsthesia, was able to use the reduced leg for standing and walking. In this case, therefore, the free locomotion of the child, respectively the functional weighting of the reduced leg, was hardly interrupted a single day. The first fixation-period lasted eight weeks. A second fixation-period was dispensed with entirely, as even with 2 cm. abduction the reduction remained stable. The total time of the fix-

ation lasted two months only in this favorable case. From this time on training in perfect freedom with a 2 cm. high sole under the well foot. The reduction is beyond criticism and doubt. The trochanter stands in its proper line, the head of the femur can be palpated and seen in the middle of the inguinal flexure, etc. In brief, not a single one of the former symptoms of the dislocation is present. The mobility is not free; flexion and extension are still strongly combined with abduction. The result will be a brilliant one in a short time. Already the characteristic luxation limping has entirely disappeared, and the gait is merely impeded by the abduction retained precautionarily.

In the same session of the Royal Imperial Association of Physicians I was able to demonstrate two more children, four years old, who, after the reposition, had to pass through a fixation-period of respectively four and six months. During almost the entire time the patients could move about freely. The fact of the stable reposition is entirely beyond a doubt. The head of the femur is to be felt in its normal place; and the shortening has been compensated for up to 1 to 2 mm. Even without a sole under the well foot the patients can walk without a trace of the characteristic sinking-in—that is, the reposition remains stable even with an indifferent position of the reduced joint.

The functional result has further grown a complete one.

A whole series of cases which so far have been subjected to the bloodless reposition have not yet passed through the fixation-periods. The question to be studied, is to find out the best and surest way of stabilizing the unstable repositions. After having brought one hundred cases to a successful termination, I will report my definitive experiences.

ROENTGEN-RAY SKIAGRAPHS.

By De FOREST WILLARD, M.D.,
PHILADELPHIA.

Talipes Equino-varus.

Dr. Willard showed two skiagraphs of an untreated case of talipes in a boy aged six years. The representation (Fig. 1) shows that the astragalus, although displaced forward and distorted, was not greater in width than the mortise between the malleoli, and that tarsectomy therefore would not be necessary to replace the foot in position.

The shadowgraph also discloses what has been so frequently noticed as a clinical fact, that is, the marked obliquity of the metatarsals in their relations to the tarsal bones. The second, third, and fourth metatarsals were plainly seen to be displaced toward the fifth, and were overlapping to one-third their diameter. The first metatarsal in its relation to the cuneiform was obliquely displaced in the opposite direction toward the tibial side of the foot and was widely separated from the second metatarsal.[1]

The radiograph showed also most clearly the epiphyseal lines of the tibia and fibula and phalanges, as well as the centres of ossification.

Subcutaneous tenotomies of all the contracted tissues and tendons, with application of forcible straightening, were found sufficient to bring the foot into its normal position. A gypsum dressing was applied on which the boy walked after four weeks.

The power of forcible straightening in overcoming the obliquity of the metatarsals is well illustrated in Fig. 2, which shows the relations of the bones two months after operation. This radiograph, though indistinct, is sufficiently clear to show the position of the bones.

[1] These radiographs were all taken by Prof. Arthur W. Goodspeed at the University of Pennsylvania.

Tubercular Knees.

Three series of skiagraphs were shown: One, the case of a man, aged thirty-eight years, who had suffered from a slow, tubercular process in the knee for two years. Partial anchylosis had occurred but as both anterior (Fig. 3) and lateral views (Fig. 4) of the knee showed the outline of the tibia and femur clear, smooth, and distinct, it was deemed safe to attempt straightening under ether. The limb was flexed to a right angle, then straightened and allowed to remain quiet until all inflammatory results had passed away. This process will be repeated later as the tissues are found to be capable of enduring the manipulation.

A second series of four skiagraphs taken from the four aspects of a tubercular knee of a patient aged twenty years, show a marked condition of joint-destruction. This individual had suffered from the tubercular process for fully ten years. The limb had become fixed in the straight position, and great erosion of the tibia and femur was disclosed. All attempts at restoration of motion were consequently abandoned lest further destructive process be awakened.

Only two of the skiagraphs of this series are here published (Figs. 5 and 6). The lateral view (Fig. 6) showed not only erosion of the bone but also partial posterior displacement.

These two series illustrate markedly the value of this process for both diagnosis and treatment.

Another series of radiographs were taken from the knee of a child aged six years. As no bony deposit was visible gentle straightening of the knee, which had become fixed at a right angle, was instituted, followed by weight-and-pulley extension. This process succeeded in four weeks in bringing the knee to a straight position.

Knock-knee.

Radiograph (Fig. 7) of a case of rickety knock-knee, in a colored child aged five years, showed that the bend was sufficiently far below the perforation of the interosseous membrane by the artery to permit of safe osteotomy without injury to the vessels. A point just below the tubercle of the tibia was selected, and the limbs were brought into the straight position without section of the femurs.

Congenital Absence of the Fingers.

Radiograph Fig. 8 shows the case of a child, aged three years, in which the fingers were represented by five tiny protuberances. While the shadowgraph shows distinctly the bones of the forearm, it disclosed the fact that while the hand was apparently normal, yet the bones were at present only cartilaginous in structure, although they may ossify later. It also showed marked cartilaginous conditions about the elbow-joint. The shadowgraph also outlines very clearly the difference in density of the fatty tissue and skin and the muscles. The child was also hypospadic.

Dr. Goldthwait exhibited some Roentgen-ray photographs: a baby's hands and feet, showing extra digits.

Dr. Ridlon said he had had made by this method a skiagraph of a bad case of knock-knee, but the negative had not yet reached him. He hoped to present it to the Association before the close of the meeting. His object in having it taken was to picture the condition of the bone before treatment by stretching and the use of plaster-of-Paris.

FIG. 2.

Indistinct radiograph of same foot as No. 5, two months after treatment.

FIG. 1.

Club-foot, showing distorted astragalus and overlapping of the metatarsals; note epiphyseal lines and centres of ossification; child, aged six years.

FIG. 3.

Tubercular knee, with partial anchylosis, but without erosion of bone; adult.

FIG. 4.

Tubercular knee, with partial anchylosis, but without erosion of bone (lateral view); adult.

FIG. 5.

Tubercular knee, with anchylosis and marked erosion of both femur and tibia: adult, aged twenty years.

FIG. 6.

Tubercular knee, with anchylosis, marked erosion of joint surfaces, and partial posterior displacement (lateral view).

FIG. 7.

Rickety knock-knee; colored child, aged five years.

FIG. 8.

Congenital absence of first and second phalanges of all fingers, with cartilaginous carpus; child, aged three years.

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